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(54) **A concrete sleeper**

(57) The present invention relates to a sleeper comprising a concrete body (109), reinforcement elements (108) embedded in the concrete body, and rail fasteners (106), wherein the sleeper has a top surface (116) and

a bottom surface (118), and wherein the rail fasteners are provided at the top surface, characterized in that the concrete body is provided with plural crack portions, wherein each crack portion contains multiple cracks (110).

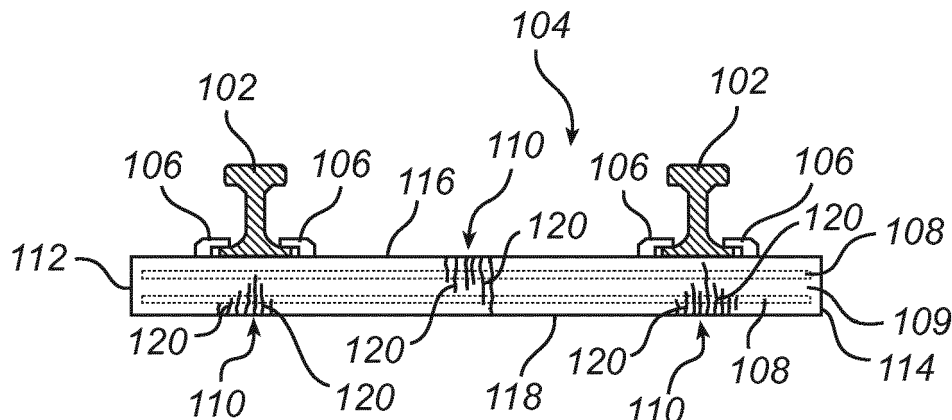


Fig. 2

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a sleeper having a concrete body, reinforcement elements embedded in the concrete, and rail fasteners mounted at a top surface of the sleeper.

BACKGROUND OF THE INVENTION

[0002] When building railway tracks today non-wooden materials are typically used for the sleepers. Most commonly, the sleepers are made of prestressed reinforced concrete. However, there are still many kilometres of railway tracks with timber sleepers. The timber sleepers degrade over time, and when a need for maintenance occurs it would be desired to replace all sleepers with new non-timber sleepers. However, mostly this is considered to be too expensive, and therefore typically only a part of the sleepers are replaced with new sleepers, i.e. spot replacement is common due to economic reasons. It is preferable to replace the degraded timber sleepers with concrete sleepers due to, inter alia, long time environmental aspects.

[0003] However, mixing concrete sleepers and timber sleepers causes problems such as vibrations in the railway wagons due to different material properties. Therefore it would be desirable to be able to modify the concrete sleeper in some way to make its properties more equal to those of the timber sleeper.

SUMMARY OF THE INVENTION

[0004] It is an object of the present invention to provide a concrete sleeper that alleviates the above-mentioned problems of the prior art and have similar properties as a timber sleeper.

[0005] The object is achieved by a sleeper according to the present invention as defined in claim 1.

[0006] The invention is based on the insight that an important property that differs a lot between a timber sleeper and a concrete sleeper is the bending stiffness, and that by deliberately cracking the concrete at predetermined portions of the sleeper it is possible to adapt the bending stiffness to resemble that of a timber sleeper in those portions.

[0007] Thus, in accordance with an aspect of the present invention, there is provided a sleeper comprising a concrete body, reinforcement elements embedded in the concrete, and rail fasteners. The sleeper has a top surface and a bottom surface. The concrete body is provided with multiple crack portions, wherein each crack portion contains multiple cracks. By means of the cracks the bending stiffness of the sleeper has been adapted, at least at the respective cracks, to a level similar to the bending stiffness of a timber sleeper. It is possible to provide the sleeper with crack portions both at the top

surface and at the bottom surface.

[0008] In accordance with an embodiment of the sleeper, the crack portions have been formed at predetermined positions of the sleeper. Thus, according to this embodiment, the crack portions can be positioned as desirable.

[0009] In accordance with an embodiment of the sleeper at least one of the crack portions is positioned at the bottom surface. Thereby the sleeper is able to bend down while the crack is temporarily widening when subject to a load directed downwards, e.g. when a railway wagon passes the sleeper.

[0010] In accordance with an embodiment of the sleeper, said multiple crack portions comprise a crack portion positioned in a position where the sleeper is arranged to receive a rail at the top surface opposite to the crack portion. Thereby, a substantive effect of individual crack portions is obtained.

[0011] In accordance with an embodiment of the sleeper, the plural crack portions cover the whole top surface and the whole bottom surface.

[0012] In accordance with an embodiment of the sleeper, the concrete body has a uniform cross-section. Thus, the shape has been adapted to that of the timber sleepers, which reduces the effort of replacing a timber sleeper with a concrete sleeper.

[0013] In accordance with an embodiment of the sleeper, the cracks of at least one of the crack portions extend from the very surface of the concrete body to a depth corresponding to at least half of the total height of the concrete body.

[0014] These and other aspects and advantages of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The invention will now be described in more detail and with reference to the appended drawings in which:

Fig. 1 schematically shows a railway track in a perspective view; and

Fig. 2 schematically shows an embodiment of a sleeper according to the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0016] A primary application for the concrete sleeper according to the present invention is as replacement for a timber sleeper of a railway track. Referring to Fig. 1, the railway track 100 comprises two rails 102 and many sleepers 104, which have been recessed in ballast (not shown). After having performed maintenance on the railway track 100, typically most of the sleepers are still timber sleepers 105, while some of them have been replaced with the concrete sleepers 104.

[0017] In accordance with a first embodiment of the sleeper 104, as shown in Fig. 2, it comprises a concrete

body 109, reinforcement elements 108 embedded in the concrete body 109, and rail fasteners 106 mounted at a top surface 116 of the sleeper 104. Furthermore, the concrete body 109 is provided with multiple crack portions 110, which have been formed at predetermined positions of the sleeper 104 between its ends 112, 114. At least one of the crack portions 110 is provided at a bottom surface 118 of the sleeper 104, and preferably below the rail fastener 106, which is arranged on top surface opposite thereof.

[0018] Within the present field of technology, cracks in the concrete body 109 has been considered a problem, but it has shown that to the contrary the cracks, when being pre-formed in a controlled fashion in accordance with the present invention, is a good solution to the problem of adapting the properties of the concrete sleepers to those of the timber sleepers.

[0019] Each crack portion 110 contains multiple cracks 120, which extend from the surface 116, 118 into the concrete body 109 to a depth corresponding to a fraction of the total height of the sleeper 104. By providing the sleeper 104 with such limited cracks 120 a significant reduction of the bending stiffness is obtained. An appropriate depth in order to reduce the bending stiffness enough has shown to be about half the height of the sleeper 104. It is possible to make the cracks 120 deeper, even to make them reach all way through the sleeper 104. Similarly, due to the circumstances it can be applicable to make the cracks 120 more shallow, extending to a depth corresponding to only a small fraction of the height. It has been foreseen that considerations regarding corrosion of the reinforcement elements 108 may arise from persons skilled in the art, since the reinforcement elements 108 may be uncovered. Although corrosion is basically desirable to avoid, it is no problem in practise within this field. On the other hand, corrosion protected reinforcement elements 108 is a possible alternative. For instance the reinforcement elements 108 can be surface protected or made of stainless steel. The reinforcement elements are conventionally arranged, and will not be further described.

[0020] The rail fasteners can be of different known types depending on application and depending on the position of the sleeper 104 along the railway track 100.

[0021] In this particular embodiment, there are three crack portions 110, wherein two crack portions 110 are respectively positioned at the bottom surface 118 below each respective rail fastener 106, and one crack portion 110 is positioned at the top surface 116 between the rail fasteners 106. Thereby the bending stiffness has been reduced at the rails and at the mid section of the sleeper 104 in comparison with an uncracked sleeper. The reduction causes a softer behaviour which resembles the behaviour of the adjacent timber sleepers 105.

[0022] The overall shape of the present sleeper 104 corresponds with the shape of conventional timber sleepers. For example, that means that the present sleeper 104, or more precisely the concrete body 109 thereof,

has a uniform cross-section. In other words, the cross-section is rectangular and the size of the cross-section is the same throughout the length of the sleeper 104.

[0023] The cracks portions 110 are, for instance, provided at a late stage of the manufacturing of the sleeper, by an appropriate loading applied to the sleeper 104 at the opposite surface of the predetermined positions where the crack portions 110 are to be formed.

[0024] While the first embodiment of the sleeper 104 is provided with merely a few crack portions 110 having limited extensions, according to further embodiments more crack portions 110 and/or to an increased extension of the crack portions are arranged. At least for particular applications, it can be preferable to provide the sleeper 104 with a large number of cracks evenly distributed along the length of the sleeper, in order to obtain a sleeper with a substantially equal local bending stiffness across the whole sleeper. In other words, the crack portions 110 may cover the whole top surface 116 and the whole bottom surface 118 of the sleeper.

[0025] Above embodiments of the sleeper according to the present invention as defined in the appended claims have been described. These should only be seen as merely non-limiting examples. As understood by the person skilled in the art, many modifications and alternative embodiments are possible within the scope of the invention as defined by the appended claims.

[0026] It is to be noted that for the purposes of his application, and in particular with regard to the appended claims, the word "comprising" does not exclude other elements or steps, and the word "a" or "an" does not exclude a plurality, which per se will be evident to a person skilled in the art.

Claims

1. A sleeper comprising a concrete body (109), reinforcement elements (108) embedded in the concrete body, and rail fasteners (106), wherein the sleeper has a top surface (116) and a bottom surface (118), **characterized in that** the concrete body is provided with plural crack portions, wherein each crack portion contains multiple cracks (110).
2. The sleeper according to claim 1, wherein said plural crack portions (110) have been formed at predetermined positions of the sleeper.
3. The sleeper according to claim 1 or 2, wherein at least one of said plural crack portions (110) is positioned at the bottom surface (118).
4. The sleeper according to any one of the preceding claims, wherein said plural crack portions (110) comprise a crack portion positioned at the bottom surface in a position where the sleeper (104) is arranged to receive a rail (102) at the top surface opposite to the

crack portion.

5. The sleeper according to any one of the preceding claims, wherein said plural crack portions (110) cover the whole top surface (116) and the whole bottom surface (118). 5
6. The sleeper according to any one of the preceding claims, wherein the concrete body (109) has a uniform cross-section. 10
7. The sleeper according to any one of the preceding claims, wherein the cracks of at least one of said crack portions (110) extend from the very surface of the concrete body (109) to a depth corresponding to at least half of the total height of the concrete body. 15

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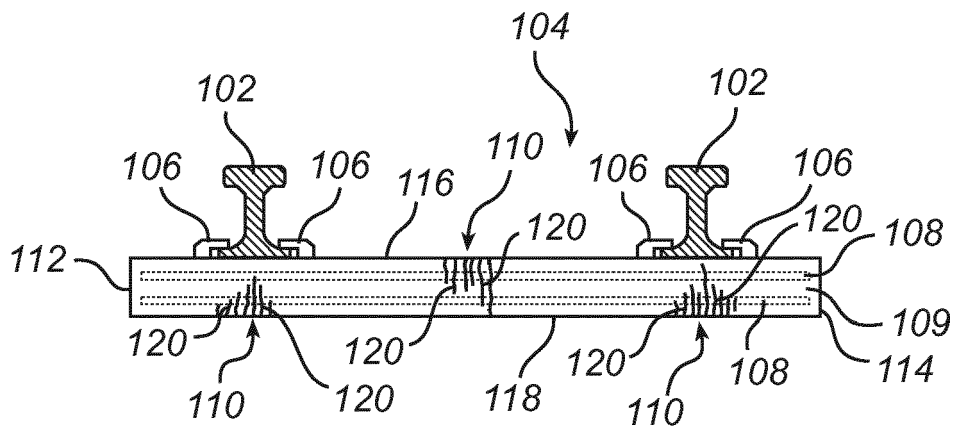
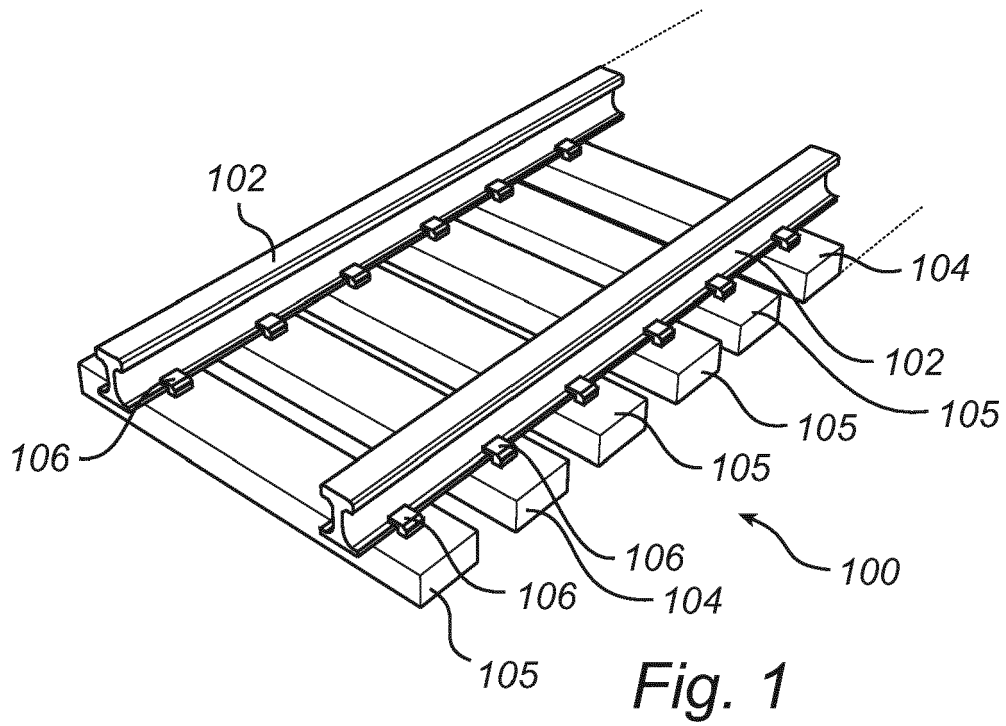
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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 9824

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2010/012742 A1 (LI VICTOR C [US]) 21 January 2010 (2010-01-21) * the whole document *	1-7	INV. E01B3/28
X	US 1 410 496 A (MORRISON WILLIAM F) 21 March 1922 (1922-03-21) * pages 1-2, line 82; figures 1-4 *	1-3,6,7	
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			TECHNICAL FIELDS SEARCHED (IPC)
			E01B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 October 2012	Examiner Movadat, Robin
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EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 16 9824

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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04-10-2012

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