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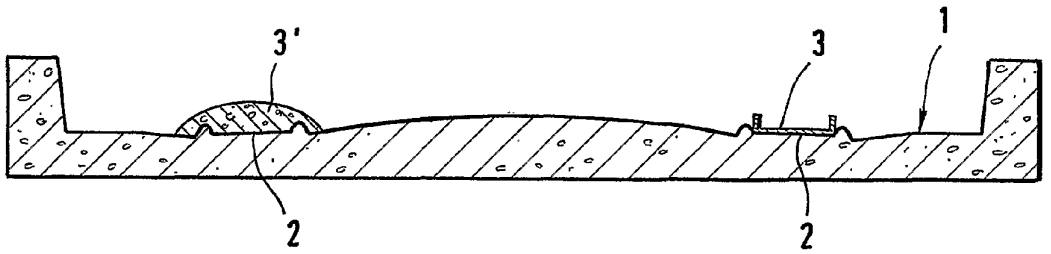
Erklärung gemäß Regel 4.17:
— *Erfindererklärung (Regel 4.17 Ziffer iv)*

Veröffentlicht:
— *mit internationalem Recherchenbericht*

Zur Erklärung der Zweibuchstaben-Codes und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

(54) **Title:** CONCRETE SLEEPER AND METHOD FOR THE PRODUCTION THEREOF

(54) **Bezeichnung:** BETONSCHWELLE UND VERFAHREN ZU IHRER HERSTELLUNG



(57) **Abstract:** Disclosed is a concrete sleeper for great dynamic loads with rail supporting areas (2) and a lower base zone. Said concrete sleeper is made of a high-strength standard concrete (4) that absorbs great pressure. The rail supporting areas (2) and/or the lower base zone is/are made of a wear-resistant, non-abrasive, or tension-proof material.

(57) **Zusammenfassung:** Betonschwelle für hohe dynamische Lasten mit Schienenauflageflächen (2) und einem unteren Sohlenbereich, bestehend aus einem hohe Druckkräfte aufnehmenden hochfesten Standard-Beton (4), wobei die Schienenauflageflächen (2) und/oder der untere Sohlenbereich aus einem verschleiß-, abrieb- oder zugfesten Material besteht bzw. bestehen.

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Concrete sleeper for high dynamic loads and method of manufacturing the same

The invention relates to a concrete sleeper for high dynamic loads with rail support surfaces and a lower rail region, consisting of a high-strength standard concrete capable of withstanding high compression forces.

In the case of high dynamic loads, the phenomena of wear and/or abrasion frequently occur in the rail support regions and on the underside of the concrete sleepers. This wear is brought about by the compression of plastics layers inserted between the rail and the concrete body of the concrete sleeper, or by the shifting of grains in the ballast bed underneath the concrete sleeper. Such abrasion phenomena may also arise for example due to the braking of the enormously long trains used in the USA and Australia, which may displace the welded rails by a few millimetres, naturally leading to corresponding abrasion action on the concrete sleepers.

In the case of pulsating vertical load, the plastics layers are also expanded and contracted in the horizontal direction and consequently rub against the concrete surface of the sleepers. On the underside of the concrete sleepers, again the ballast grains rub against the concrete body. This results in the removal of material at the rail support points and on the underside of the concrete sleeper. Consequently, the geometry and carrying capacity of the concrete sleepers is sufficiently impaired over time that these are no longer fit as safe, stable supporting elements.

The object of the invention is therefore to create a concrete sleeper of the type mentioned in the introduction which counteracts these properties of wear at minimal cost.

To achieve this it is proposed according to the invention that rail support surfaces and/or the lower sole region consist(s) of a wear-resistant, abrasion-resistant or tension-resistant material.

In addition, the invention relates to a method of manufacturing a concrete sleeper of the type described.

It may be provided according to the invention that the wear-resistant, abrasion-resistant or tension-resistant material is inserted as a prefabricated plate or profile into a sleeper mould below or on the standard concrete and bonds therewith as this hardens.

The wear-resistant, abrasion-resistant or tension-resistant material may be an inserted metal angle, for example.

According to an alternative embodiment of the invention it can be provided that the wear-resistant, abrasion-resistant or tension-resistant material is bonded and hardened wet-on-wet with the standard concrete in a sleeper mould, in that according to the type of placing in the sleeper, first the wear-resistant, abrasion-resistant or tension-resistant material is inserted into the sleeper mould as a special concrete material and then the standard concrete is poured in or conversely the standard concrete is poured in first and then, to form the wear- and abrasion-resistant sole, the special concrete material is introduced into the sleeper mould as the top layer.

According to the invention, in this method, by introducing the different plastic concrete materials directly one after another, wet on wet, the standard concrete and the special concrete material can be mixed together in their border region by shaking or vibrating in such a manner that they form a monolithic body, but one which has over its height the desired differing bending tensile strength or abrasion-resistance.

Alternatively, in a development of the method according to the invention, it can be provided that a preferably prefabricated plate composed of plastics material is used, the plate preferably being inserted in the liquid or still-plastic form into the concrete mould and in this state forming a bond with the concrete.

Further advantages and details of the invention will appear from the following description of some embodiments and from the drawings, which show:

Figures 1 and 2, a section through a sleeper mould for manufacturing a concrete sleeper according to the invention having abrasion-resistant rail support surfaces, different modifications being shown to the left and right,

Figures 3 and 4, a longitudinal section through a sleeper mould in two different stages of filling for the manufacture of a concrete sleeper according to the invention with abrasion-resistant and/or wear-resistant material in the lower sole region of the concrete sleeper,

Figures 5 and 6, longitudinal sections through a sleeper mould in the manufacture of a concrete sleeper according to the invention with high tensile strength in the lower sole region, and

Figures 7 to 9, sections through a sleeper mould in the various stages of manufacture of a concrete sleeper, which is exposed in the centre of the upper face to high tensile stresses.

In Fig. 1, a sleeper mould 1 is shown which has the shaping regions for forming rail support surfaces 2. In order to achieve increased abrasion- and wear-resistance in the region of these rail support surfaces 2 acting as supports in the case of high dynamic, possibly pulsating vertical loads, either, as is shown to the right in Fig. 1, steel angles 3 can be inserted before filling with the sleeper concrete, or a first concrete layer 3' consisting of an abrasion- and wear-resistant material can be applied, as is shown to the left in Fig. 1. Then the

mould is filled with a standard sleeper concrete 4, as is shown in Fig. 2. In this case, a prefabricated component, in the present case the steel angle 3, is bonded into the pressure-resistant standard concrete 4 or by shaking and vibration, shown to the left, the two types of concrete are mingled in the border region, so that a monolithic body is formed, but one which has over its height the desired different properties of abrasion- and wear-resistance.

In Figures 3 and 4, the method of manufacturing a sleeper with high abrasion- and wear-resistance in the lower sole region is shown. To this end, first the standard concrete 4 is introduced into the sleeper mould 1, leaving a slight layer thickness free at the top, and then still in the wet state of the standard concrete 4, a layer of an abrasion-resistant and/or wear-resistant special concrete 3" is applied.

In the embodiment according to Figures 5 and 6, the manufacture of a sleeper is shown for rail sections in which high tension forces occur in the lower region of the concrete sleepers. Into the sleeper mould 1, first, as before, the standard concrete 4 with a high pressure-resistance is introduced up to about half the sleeper height, and then a special concrete 3"' with a high tensile strength is poured in, and again by compression and vibration, a monolithic bond of the two types of concrete is achieved in the border areas.

Finally, Figures 7 to 9 show an embodiment in which a concrete sleeper, as manufactured in Figures 5 and 6, has been prepared for the case where it rests in the centre, with the consequence that additional tensile stresses can occur on the upper face in the centre. To this end, first a tension-resistant concrete layer 3"" is applied in the centre of the sleeper mould 1 as a first concrete layer, and then the normal standard concrete 4 is introduced into the sleeper mould 1, and then correspondingly to Figures 5 and 6, the tension-resistant special concrete 3"' is poured in as a further concrete layer.

The invention is not limited to the embodiments shown. Due to the different use of abrasion-resistant or wear-resistant special types of concrete and tension-resistant concrete in different regions of the sleeper, for example, the modification which increases tensile strength according to Figures 5 to 9 could be combined with the modification in which a high abrasion-resistance is achieved, as is shown for example in Figures 1 to 4.

Claims

1. Concrete sleeper for high dynamic loads having rail support surfaces (2) and a lower sole region, consisting of a high-strength standard concrete (4) capable of withstanding high compression forces, characterised in that the rail support faces (2) and/or the lower sole region consist(s) of a wear-resistant, abrasion-resistant or tension-resistant material.

2. Concrete sleeper according to claim 1, characterised in that the wear-resistant, abrasion-resistant or tension-resistant material is a prefabricated plate or profile or a metal angle, in particular a steel angle (3).

3. Concrete sleeper according to claim 1 or 2, characterised in that the wear-resistant, abrasion-resistant or tension-resistant material is a concrete layer (3', 3'''') bonded to the standard concrete (4) and/or is a special concrete (3'', 3''').

4. Method of manufacturing a concrete sleeper for high dynamic loads, consisting of a high-strength standard concrete (4) capable of withstanding high compression forces, having rail support surfaces (2) and a lower sole region, characterised in that the rail support surfaces (2) and/or the lower sole region is/are manufactured from a wear-resistant, abrasion-resistant, or tension-resistant material, which is inserted into a sleeper mould (1) below or on the standard concrete (4) as a prefabricated plate or profile and bonds to the standard concrete as this hardens.

5. Method of manufacturing a concrete sleeper according to claim 4, characterised in that a metal angle, in particular a steel angle (3) is inserted as a wear-resistant, abrasion-resistant or tension-resistant material.

6. Method of manufacturing a concrete sleeper according to claim 4, characterised in that the wear-resistant, abrasion-resistant or tension-resistant material as a first concrete layer (3', 3'''') and/or as special concrete (3'', 3''') is

bonded to the standard concrete (4) wet-on-wet in a sleeper mould (1) and is hardened.

7. Method of manufacturing a concrete sleeper according to claim 6, characterised in that the different types of concrete are introduced one after another into the sleeper mould (1) and are mixed in the border region by shaking or vibrating in order to form a monolithic body.

8. Method of manufacturing a concrete sleeper according to claim 4, characterised in that a preferably prefabricated plate of plastics material is used.

9. Method of manufacturing a concrete sleeper according to claim 8, characterised in that the plate is introduced into the sleeper mould (1) in the liquid or still-plastic form and in this state forms a bond with the concrete.

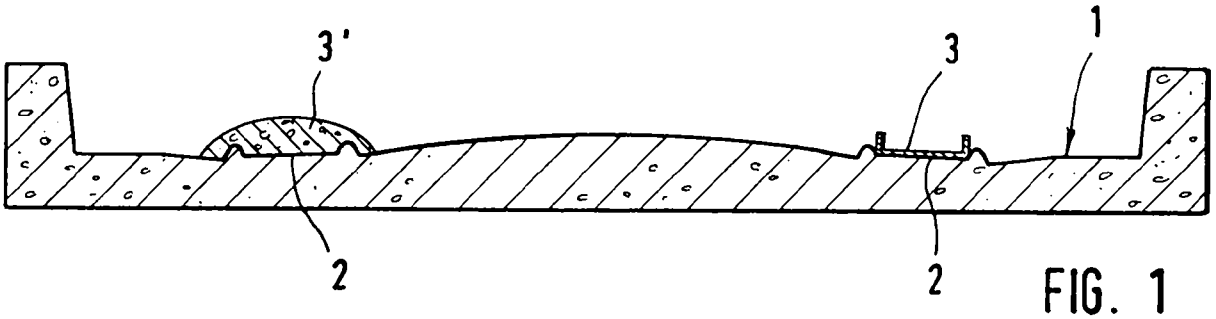

FIG. 1

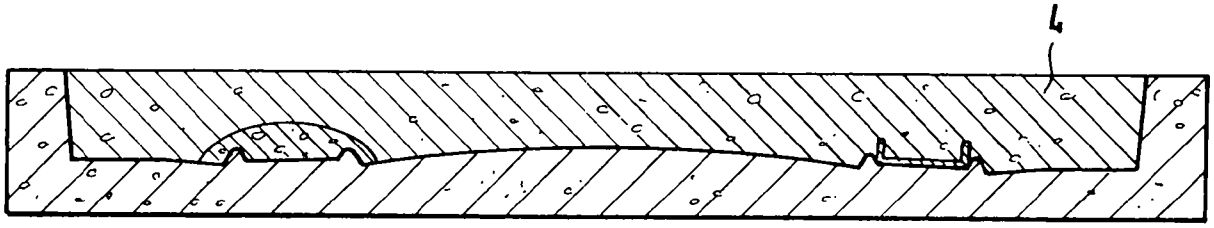

FIG. 2

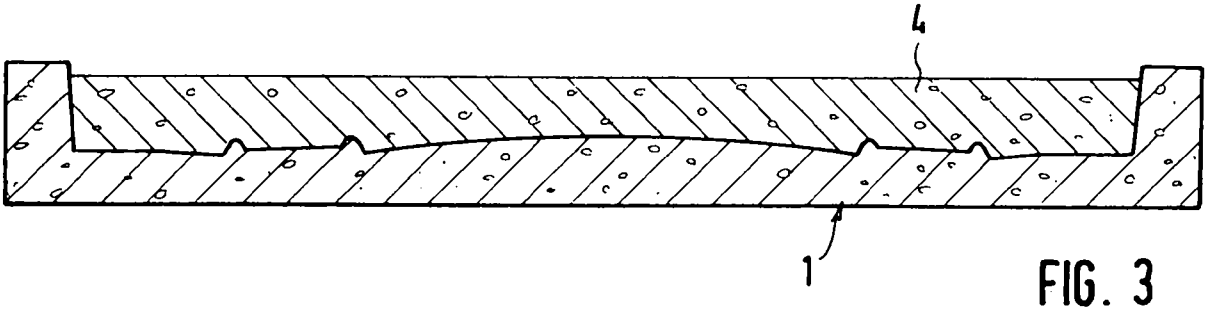

FIG. 3

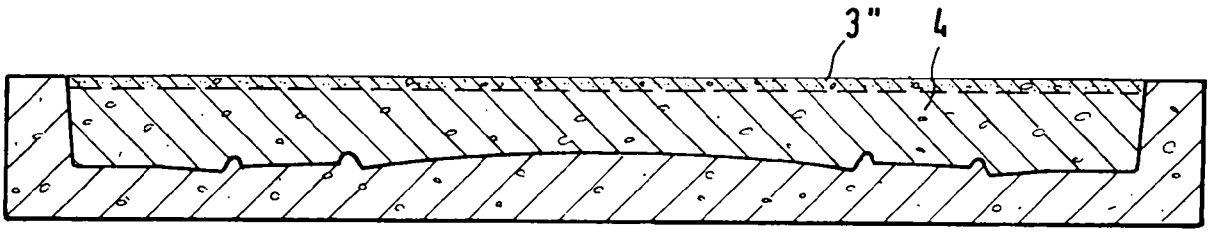

FIG. 4

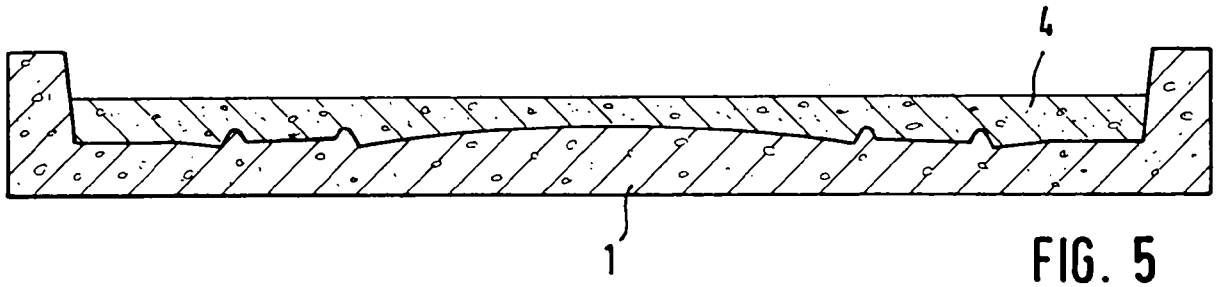

FIG. 5

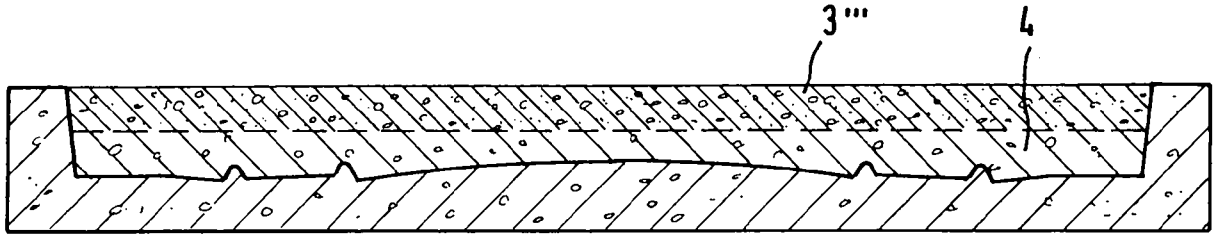

FIG. 6

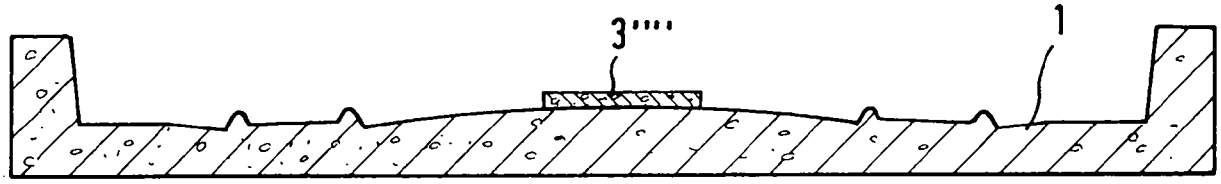

FIG. 7

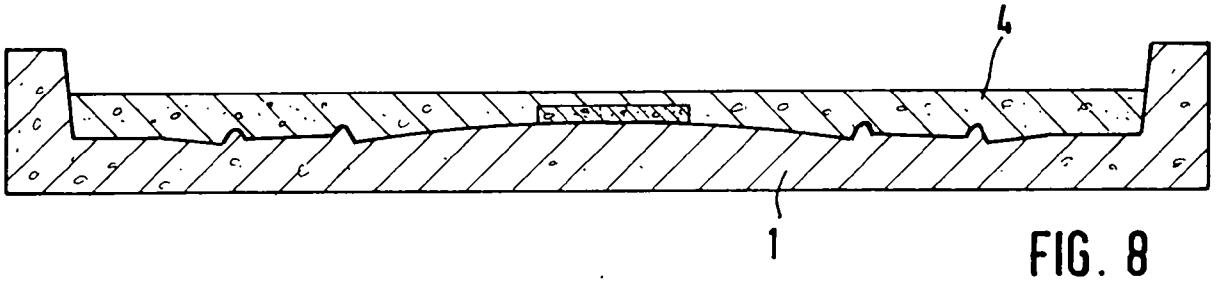

FIG. 8

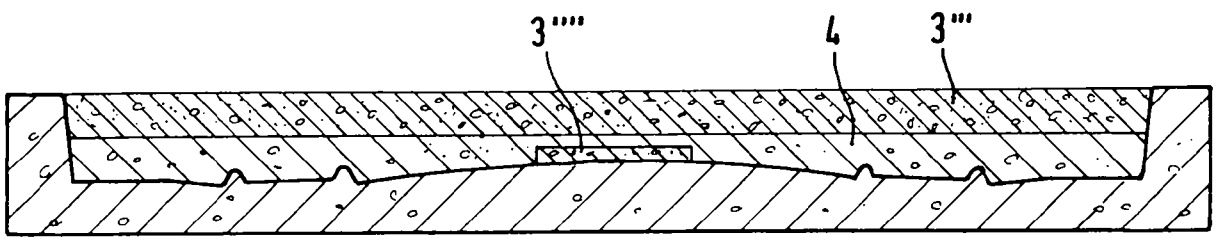

FIG. 9