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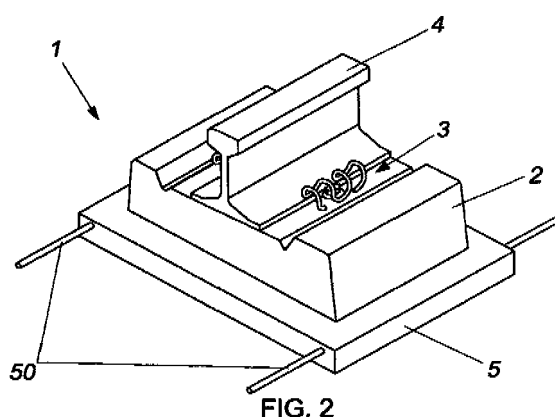
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(54) **Damping material for railway rails**

(57) A damping material for train rails which is comprised of a solid mixture of granules derived from the recycling of used tyres and 5% - 45% of polymer by weight of the granules. The prefabricated block (1) for support of a railway rail is comprised of a solid block (2), fixing means (3) for the fixing of the railway rails (4) to said

block (2), and a base (5) constituted from the said damping material and joined to the solid block (2). The encased rail (40) is comprised of a casing (41), constituted of said damping material, and a rail (4a) embedded in the casing (41), wherein the casing (41) is adhered to the rail (4a) and covers its entire perimeter with the exception of the running upper surface (4ab).



## Description

### OBJECT OF THE INVENTION

[0001] The main object of the present invention comprises a damping material for railway rails, a prefabricated block for support of railway rails which incorporates said damping material, a rail encased in said damping material, and the process for the preparation of said block and said rail, all specially designed for the damping support of railway rails.

### BACKGROUND OF THE INVENTION

[0002] The use of granulated products derived from the recycling of tyres for the support and damping of train rails is known at present.

[0003] For example, document JP2002326225 discloses the use of rubber chips obtained by the grinding-up of used tyres, as a fill element between the rails in the construction of railway tracks, with the object of providing elasticity to the rails.

[0004] Korean patent document KR20020050095 discloses a product based on polymer and gravel which employs used tyres and which is used in the construction of a railway track which has reduced noise and vibration. In that document, the combined use of polymer and recycled tyres together with gravel without defined proportions is disclosed.

[0005] Korean patent document KR20040017012 relates to a railway sleeper composed of a steel block whereon the rails are supported and an injected coating of recycled tyre powder, which serves as a support to the assembly of the rails and the block of steel.

[0006] European Patent Application EP1197598 discloses a vibration damper situated between the rails of a railway track, with an intermediate arrangement between the sleepers whereupon the rails are supported. Specifically detailed in claim 7, of the manufacture of the vibration damper from elastic materials which dampen the vibrations, such as granules of recycled rubber embedded in a polyurethane matrix.

[0007] Spanish utility model application ES1065079 discloses a rail support block assembly consisting of a prefabricated plastic tray and a block. The assembly is mounted in the sub-structure of a railway track. The block is comprised of an upper part, a base and a peripheral wall, and at least one rail is supported on said block. The plastic tray is formed by two encapsulated trays and an elastomeric elastic structure is disposed there between which contains a type of cork called 'Corkelast'. The outer tray is prefabricated from plastic or concrete and has anchorages for coupling to concrete slabs. Nevertheless, the use of the prefabricated elastic tray based on a sandwich of two other trays with a filling of elastomeric material presents various drawbacks, not least of which is a relative heaviness and the lack of the use of waste materials.

## DESCRIPTION OF THE INVENTION

[0008] The damping material of the invention has an optimal constitution to be used in the support and damping of railway rails, it is very light and has environmental advantages because it avails of the granulated remains (hereinafter, simply referred to as 'granules') derived by the recycling of tyres.

[0009] In accordance with the invention, the damping material comprises a solid mixture of the granules produced by the recycling of used tyres, and 5% - 45% of a binding polymer in relation to the weight of granules.

[0010] The polymer may be polyurethane or epoxy.

[0011] The addition of specific amounts of water may be required in the preparation of the polymers, something which is also required in the casing of polyurethane polymers (the water acts as a catalyst). In that event, the preferred amount of water used is equivalent to 2% of the total weight of the polymer.

[0012] In general, a greater or lesser stiffness can be imparted to the material of the invention, by adjusting the grading of the granules or granulometry as well as the nature and proportion of the polymers used, varying its characteristics in respect of the damping of noise and vibration: Less damping of noise and vibration is produced in respect of greater stiffness and *vice-versa*.

[0013] Another object of the invention relates to a prefabricated block which can serve for the assembly of a track panel, which is a track seated on a slab of concrete, instead of on the traditional ballast. This block incorporates parts of the material of the invention which result in the presentation of reduced noise and vibration characteristics. In addition, it is easy to handle and has reduced weight and costs. These blocks are designed specifically to support the track rails which can be used in railway tracks, light rail and heavy rail. The pre-fabricated block of the invention comprises a solid die shaped block, normally of concrete; means for fixing the rail or rails to said solid block; and a part joined to the solid block constituted from the damping material of the invention.

[0014] The fastening means comprise any type of fastening devices, for example Vossloh fasteners. In addition, reinforcement means may be embedded in the base whose exposed parts play a role in the fixing of the prefabricated block to the concrete slab, if this is manufactured after the arrangement of the prefabricated block.

[0015] In order to achieve the joining of the base and the solid block, the manufacturing procedure of the block comprises kneading a mixture of granules and polymers corresponding to the damping material, disposing said mixture in a mould before curing, disposing the reinforcing as required therein beforehand, and the subsequent insertion of the solid block, once the mixture of damping material has been removed from the mould after curing.

[0016] Another object of the present invention consists of a rail encased in the damping material of the invention. This is also designed to be assembled in a track panel and is designed specially to support the railway rails

which can be used in railway tracks, light rail and heavy rail. It has the advantage that it remains embedded and at the same level as the panel, which enables the traffic of other vehicles on the track.

**[0017]** The encased rail of the invention dampens effectively the noise and vibrations produced by the passage of the passing trains, it has a reduced cost and provides all of the advantages inherent to a slab track system, enabling a greater durability of rails and a lack of mechanical fittings and avoiding the needs for realignment of rails. It also has a high electrical resistance and is completely watertight.

**[0018]** The encased rail comprises a unitary configuration formed from a casing made from the damping material of the invention and a rail embedded and adhered to said casing in a manner that its periphery is completely covered with the exception of its superior running surface.

**[0019]** It should be pointed out that this description employs the term "encased rail" to describe the assembly of the rail and the casing of damping material, and the term "rail" to refer to the rail proper.

**[0020]** The procedure of the manufacturing of the encased rail of the invention comprises the kneading of the mixture of the granules and the polymers, making a laid base in a mould using a first quantity of the mixture, and the arrangement of a rail on that laid base, and the filling of the side parts of the mould, levelling up to the top of the rail, and removing from the mould after curing. Following this procedure enables the casing of damping material which is adhered perfectly to the rail and which is a single piece.

**[0021]** The casing preferably has an overtilted prism shape which features a planar lower support surface. Moreover, to improve its grip on the slab of concrete or asphalt, it is envisaged that some profiles may be implemented in its outline.

## DESCRIPTION OF THE DRAWINGS

**[0022]** To complement this description and in order to aid towards a better understanding of the characteristics of the invention, in accordance with a preferred example of practical embodiment thereof, a set of drawings is attached as an integral part of the description, where, with illustrative and non-limiting character, the following has been represented:

Figure 1: Shows a cross-section view of the block of the invention.

Figure 2: Shows a perspective view of the block of the invention.

Figure 3: Shows a cross-section view of the encased rail of the invention.

Figure 4: Shows a perspective view of the block of the encased rail of the invention installed in an assembly of a track panel

## PREFERRED EMBODIMENT OF THE INVENTION

**[0023]** The damping material of the invention comprises a solid mixture formed from granules derived from the recycling of used tyres, and 5% - 45%, based on the weight of granules, of a binder polymer.

**[0024]** Moreover, it is estimated that in all of the mixtures employed for the polymers a constant quantity of water equivalent to 2% of the total weight of the polymers is included.

**[0025]** The polymers may be polyurethane or epoxy.

**[0026]** In the case of polyurethane polymer, the mixture may be made at ambient temperatures, with the curing thereof over a period of approximately 24 hours.

**[0027]** The granules of tyres may employ mixtures of different granulometries or specifically thick granulometry or G (wherein the size of the granules is comprised between 2 and 5 mm), medium or M (size of the granules comprised between 0.5 and 2 mm), and fine or F (size of less than 1 mm).

**[0028]** One application of the invention devised for heavy railway vehicles, shown in Fig. 1 and 2, comprises a prefabricated block (1) which incorporates the damping material described. The prefabricated block (1) comprises a solid die block (2) with approximately cubic shape, normally of concrete; fixing means (3) of the railway rails (4) to said die block (2); and a base (5) constituted from the damping material of the invention and joined to the solid block. The fastening means (3) comprise in this embodiment U-shaped brackets (30), seated pieces (31) and screwed-in ties (32). Furthermore, in a preferred variant embodiment of the invention, the base (5) has an elongation (5a), as shown in Fig. 1, which is disposed overlapping the peripheral lower ends of the solid die block (2) assisting in the fastening thereto.

**[0029]** The block (1) is specially designed for the assembly of slab tracks systems, and for this purpose the arrangement of protruding frameworks (50), which are typically integrated in the base (5) which, while embedded in the concrete slab, and although not shown in Fig. 1 or 2, enables an effective fixing of the block thereto.

**[0030]** A very preferred variant of the damping material of the invention for the block (1) of the invention comprises using 35% - 45% of a polyurethane polymer in respect of the weight of the granules for the base (5), with said granules being of a course grade of type C. In the side extensions (5a) of the block a mixture is employed comprised of 35% - 45% of a polyurethane polymer in respect of the weight of the granules and granules derived from the recycling of tyres which have a medium, or type M grade, or fine or type F grade.

**[0031]** Another preferred variant of the damping material of the invention comprises using a mixture of 5 - 15% of polymer in respect of the weight of the granules as the damping material and granules derived from the recycling of tyres with a medium or M grade, or a fine or F grade.

**[0032]** The procedure of the manufacture of the block

(1) comprises: kneading a mixture of granules and polymer corresponding to the damping material, introducing said mixture to a mould before curing it, and inserting the block immediately, then removing from the mould once the mixture of the damping material is cured. In addition, the frameworks (50) may be disposed in the mould before introducing the mixture.

[0033] In any event, the damping material is perfectly adhered to the block (2) on the curing of the mixture of granules and the polymer in contact therewith.

[0034] In accordance with another application of the invention designed for railway tracks, light rail and heavy rail (see Figs. 3 to 5), an encased rail (40) has been designed cased in the damping material of the invention. The encased rail (40) comprises a casing (41) constituted based on said damping material of the invention, and the railway rails (4a) embedded in said casing (41). The casing (41) covers and adheres to the entire periphery of the railway rails (4a) with the exception of the upper running surface (4ab), and once assembled remains embedded in the concrete slab (60) allowing wheeled traffic (see Fig. 5). The rail referred to in Figs. 3 to 5 designated by the reference (4a) is thus distinguished from the railway rails (4) which may be used in the block (1) and shown in Fig. 1 and Fig. 2, since they have different sections.

[0035] The casing (41) preferably has an overtilted prismatic shape, and it is envisaged that its outline incorporates profiles which improve its fixing to the slab (60). These profiles, preferably take the form of lower side heels (43), which also increases the lower support surface of the encased rail (40).

[0036] A variant of the encased rail (40) is shown in Fig. 3. It comprises using 25% - 35% of polyurethane polymer in relation to the weight of the granules for the casing (41), with the granules being based on a mixture of grades C and M ideally in an approximate proportion of 50% each.

[0037] Another variant of the embedded rail (40) is shown in Fig. 3. It comprises using 25% - 35% of polyurethane polymer in relation to the weight of the granules for the casing (41), with the granules comprising a mixture of grade M.

[0038] The procedure of preparation of the encased rail (40) comprises: kneading a mixture of granules and resin; making a laid base in a mould using a first quantity of the mixture, and the arrangement of the railway rails (4a) on that laid base; filling of the side parts of the mould, levelling up to the top of the rail (4a), and removing from the mould after curing. Following this procedure enables the casing of damping material which is adhered perfectly to the rail and which is a single piece.

[0039] In any event, the casing (41) is disposed wrapping the side faces and underside of the rail (4a) and is perfectly adhered thereto, once the mixture of polymer and granules in contact with the railway rails (4a) are cured.

## Claims

1. A damping material for railway rails (4) **characterized in that** it comprises a solid mixture of granules, derived from the recycling of used tyres, and 5% - 45 of polymer in respect of the weight of the granules.
2. The damping material according to claim 1, **characterized in that** the polymer is selected from polyurethane polymer and epoxy polymers.
3. The damping material according to claim 1 or claim 2, **characterized in that** the granulated residues comprise coarse, medium or fine granules or mixtures of the same.
4. A prefabricated block (1) for supporting railway rails (4), **characterized in that** it comprises: a solid die block (2), fastening means (3) of the railway rails (4) to said die block (2), and a base (5) fixed to the solid die block (2), and constituted from said damping material of any of claims 1 to 3.
5. The prefabricated block (1) for supporting railway rails (4) according to claim 4, **characterized in that** the base (5) has an extension (5a) which is disposed overlapping the peripheral lower ends of the solid die block (2).
6. The prefabricated block (1) for supporting railway rails (4) according to claim 4 or claim 5, **characterized in that** it comprises protruding frameworks (50) which are integrated in the base (5) in order to facilitate the fixing of the block (1).
7. The prefabricated block (1) for supporting railway rails (4) according to claims 4, 5 or 6, **characterized in that** the damping material for the base (5) comprises 35 - 45% of polyurethane polymer and granules of thick granulometry; While the side extensions (5a) comprise a mixture formed from 35 - 45% polyurethane resin in respect of the weight of the granules, with the granules derived from recycled tyres with a medium or fine granulometry.
8. The prefabricated block (1) for supporting railway rails (4) according to claims 4, 5 or 6, **characterized in that** the damping material for the base (5) comprises 5 - 15% of epoxy polymer and granules thick granulometry; while the side extensions (5a) are comprised of a mixture formed from 15 - 25% epoxy resin in respect of the weight of the granules, with the granules derived from recycled tyres with a medium or fine granulometry.
9. The encased rail (40), **characterized in that** it comprises:

- a casing (41) constituted of the damping material according to any of claims 1 to 4, and
- a rail (4a) embedded in the casing (41),

Wherein the casing (41) is adhered to the railway rails (4a) and covers the entire perimeter thereof with the exception of the running upper surface (4ab). 5

10. The encased rail (40) according to claim 9, **characterized in that** the casing (41) has an overtilted prismatic shape. 10
11. The encased rail (40) according to claim 9 or claim 10, **characterized in that** the casing (41) has profiling in the outline thereof. 15
12. The encased rail (40) according to claim 11, **characterized in that** the profiling of the casing (41) takes the form of lower side heels (43). 20
13. The encased rail (40) according to any of the claims 9 to 12, **characterized in that** the damping material of the casing comprises 25 - 35% of polyurethane resin in respect of the weight of the granules, with the grade of granules being a mixture of course and medium in an approximate proportions of 50%. 25
14. The encased rail (40) according to any of the claims 9 to 12, **characterized in that** the damping material of the casing comprises 25 - 35% of polyurethane resin in respect of the weight of the granules, with a mixture of medium grade granules. 30
15. A procedure for the preparation of the prefabricated block (1) of any of claims 4 to 8, **characterized in that** it comprises: kneading a mixture of granules and polymers corresponding to the damping material, disposing said mixture in a mould before curing, insertion of the solid block (2), and removed from the mould after curing the damping material. 35 40
16. A procedure for the preparation of the prefabricated block (1) of any of claims 4 to 8, according to claim 15, **characterized in that** it additionally comprises disposing frameworks (50) in the interior of the mould before introducing the mixture. 45
17. A procedure for the preparation of the encased rail (40) of any of claims 9 to 14, **characterized in that** it comprises: kneading a mixture of granules and resin; making a laid base in a mould using a first quantity of the mixture, and the arrangement of the rail (4a) on that laid base; filling of the side parts of the mould with the mixture, and levelling up to the top of the railway rails (4a), and removing from the mould after curing. 50 55

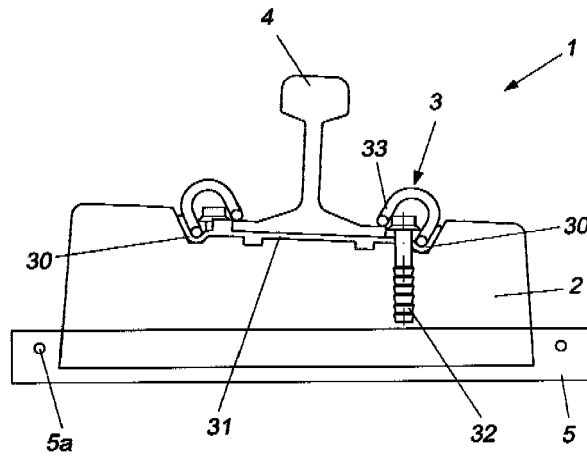


FIG. 1

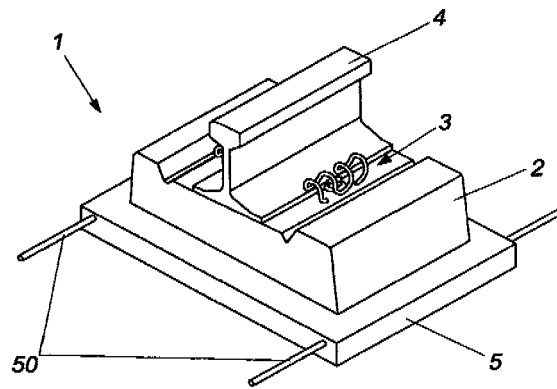


FIG. 2

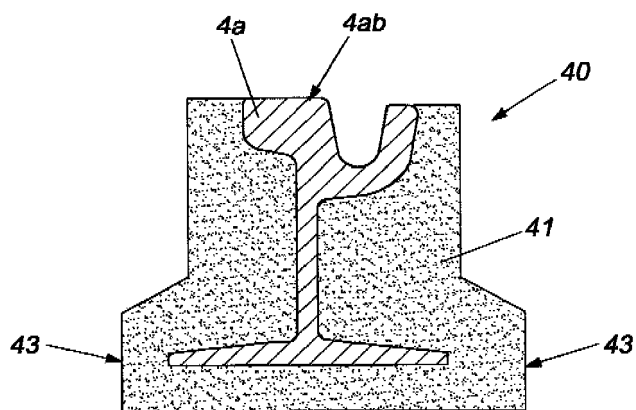


FIG. 3

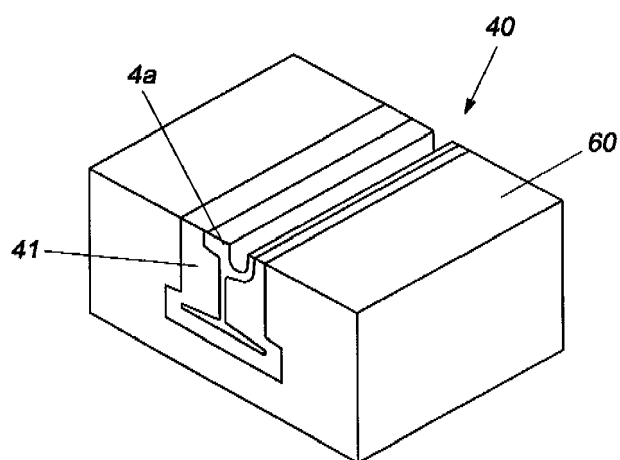


FIG. 4



## EUROPEAN SEARCH REPORT

Application Number  
EP 10 17 2914

| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | WO 2008/087027 A1 (EDILON SEDRA GMBH [DE]; FROTTIER JEAN-PIERRE [DE]; EILMES HORST [DE];) 24 July 2008 (2008-07-24)                                   | 1-3                                                 | INV.<br>E01B3/40<br>E01B19/00           |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                       |                                                     |                                         |
| Place of search<br>Munich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                       | Date of completion of the search<br>9 February 2011 | Examiner<br>Movadat, Robin              |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                       |                                                     |                                         |

EPO FORM 1503 03.82 (P04C01)



Application Number

EP 10 17 2914

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number

EP 10 17 2914

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-8, 15, 16

Prefabricated block comprising a dampening material

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2. claims: 1-3, 9-14, 17

Encased rail using a dampening material

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

EP 10 17 2914

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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09-02-2011

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**REFERENCES CITED IN THE DESCRIPTION**

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