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(54) Prestressed concrete railway sleeper provided with a device for increasing the transmission of the stresses between the metallic reinforcement and the mix

(57) The present invention relates to a prestressed concrete railway sleeper provided with a device for increasing the transmission of the stresses between the metallic reinforcement elements and the mix, comprising a high elastic limit steel wire spiral (4; 4') provided coaxially externally around at least one reinforcement element (3) in the zone interested by the transmission of the stresses.

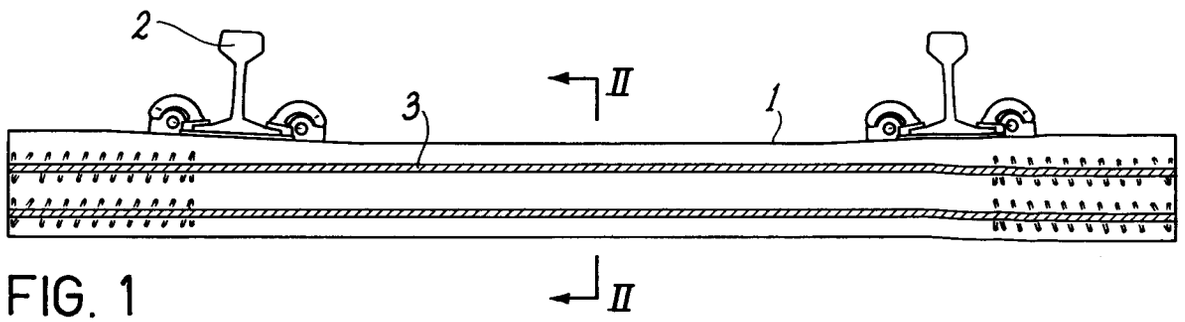

FIG. 1

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The present invention relates to a concrete railway sleeper provided with a device for increasing the transmission of the stresses between the metallic reinforcement and the mix.

More particularly, the invention relates to the realization of prestressed railway sleeper of any kind, gauge and performances, provided with a device as indicated, suitable both for the normal railways that for the high speed railways.

It is well known to those skilled in the art that one of the most important problems in the field of the manufacturing of prestressed railway sleepers is that of succeeding in transmitting in the best way the compression stresses within very short lengths.

Another problem very interesting is without any doubt that relevant to the possibility of obtaining said transmission of the stresses without increasing the manufacture costs and without complicating the same manufacturing techniques.

Until now, all the known solutions are not enough reliable in order to satisfy the operative needing of the concerned product, said needing being very different.

In this situation, the Applicant has thought to and realized a prestressed railway sleeper with adherent wire, bar, braid or strand, provided with a device by which the stress transmission length, i.e. the anchoring length of the steel bars, braids, strands and of the mix, is noticeably reduced.

In this way, the prestress is completely transferred to the mix sleeper in a short length from the free head and before the section under the rail.

The longitudinal shape of the rail can be of any kind and in conformity with the Italian and foreign railway rules.

These and other results are obtained according to the invention proposing a device substantially comprising a spiral made up of a steel wire with a high elastic limit, coaxially provided with respect to the bar, braid or strand in the zone where the improvement of the stress transmission is desired.

It is therefore specific object of the present invention a prestressed concrete railway sleeper provided with a device for increasing the transmission of the stresses between the metallic reinforcement elements and the mix, comprising a high elastic limit steel wire spiral provided coaxially externally around at least one reinforcement element in the zone interested by the transmission of the stresses.

In a preferred embodiment of the railway sleeper according to the invention, a positioning element for the spiral will be provided concentrically with respect to the reinforcement element during the mix casting, said element particularly comprising a shaped bar so as to conform to the profile of the reinforcement element and to fix above and below the spiral.

Still according to the invention, in correspondence of the end portion of the reinforcement element upon which the device of the sleeper according to the invention is provided, an end element could be provided, said element spacing the final part of the mix from the leading end of the spiral.

Preferably, according to the invention, said spiral will be made up of zinc plated steel with high elastic limit of stainless steel.

Still according to the invention, said spiral can be coaxially provided on two reinforcement elements.

Always according to the invention, the diameter of said spiral can be uniform or variable.

Particularly, the geometrical features of the device according to the invention can be summarised in the following table:

$$L \geq (\sigma_0/400)\,\varnothing$$
$$4 < D/\varnothing < 15$$
$$D > 4\ \text{cm}$$
$$D/2 < P < 2D$$
$$20° < \phi < 45°$$
$$1 < D_{min}/D_{max} < 3$$

wherein

- L = spiral length,
- P = spiral pitch,
- D = inner diameter of the spiral
- ϕ = spiral inclination,
- $\varnothing$ = reinforcement element diameter
- σ_0 = steel tension.

The present invention will be now described, for illustrative, but not limitative purposes, according to its preferred embodiments, with particular reference to the figures of the enclosed drawings, wherein:

Figure 1 is a diagrammatic view of a railway sleeper provided with the device according to the invention;

figure 2 is a section view along the line II-II of figure 1;

figure 3 shows a particular of the sleeper of figure 1;

figure 4 is a section view along the line IV-IV of figure 3;

figure 5 is a section view along the line V-V of figure 3;

figure 6 particularly shows the device according to the invention employed in the railway sleeper of the preceding figures;

figure 7 particularly shows the fixing device of the device of the railway sleeper according to the invention for the insertion within the mix; and

figure 8 particularly shows a second embodiment of the device of the railway sleeper according to the invention.

In the enclosed drawings, it is shown a specific railway sleeper according to the invention, but it is understood that the use of the device cannot be limited to the one described, since the different applications will be well evident to those skilled in the art.

In figures 1 - 7 it is shown for illustrative purposes a sleeper 1 for rails 2 providing four strands 3. The number of strands can be increased up to six or eight.

On the final part of each strand 3, thus in correspondence of the end of the sleeper 1, a spiral 4 is provided, coaxially with respect to the strand 3, that could, for example, have a pitch of 3 cm, with an inner diameter corresponding to the diameter of the strand 3, plus 4 cm.

The spiral 4 will have, for example, a length 25 times longer than the diameter of the strand 3.

As already said, preferably, the spirals 4 are made up of zinc plated high elastic limited steel (type Fe B44 K), or of stainless steel.

Thus, by the device here illustrated it is possible to realize employing the prestress technique to prestressed sleepers with adherent strands having better performances with respect to the prestressed sleepers employing post - stretched wires with mix having strength feature higher than 50 N/mm^2.

As it can be noted from the enclosed claims, the spirals 3, in case they are applied to sleepers 1, extend up to the outer edge of the rail 2 flange, or can prosecute up to 5 cm besides the inner edge of the same rail 2.

Observing now particularly the figures 6 and 7, further features of the device for the railway sleeper according to the invention can be noted.

Particularly, in figure 7 it is shown an element 5 necessary to place the spiral 4 correctly with respect to the strand 3 before casting the sleepers 2.

In figure 6 it is instead shown an optional element 6, according to the manufacturing needing and the use conditions of the handwork, provided on the strand 3, in correspondence of the outer end of the sleeper 2, so that when the strand is cut, a degeneration of the mix in the zone of the cut and further an initiation of the corrosion action of the same strand 3 are avoided.

Practically, the process for making the sleepers 2 comprising the device according to the invention comprises the step of positioning the spirals 4 within the strand 3, after having prepared the strand pull track and provided the casting forms, by the devices 5 and 6 of figures 6 and 7.

After having tensioned the strands 3 and checked the positions of the spirals 4 it will be possible start the casting of the sleepers during their curing, and then it is possible to cut the strands 3 at their prestress.

In figure 8 it is shown a second embodiment of the device according to the invention, usable for sleepers 2 of the above mentioned kind or for other applications.

The feature of spiral 4' of figure 8, is that of having a diameter reduction from the external edge inwardly, so as to exploit at the best its features and to realize a reinforcement element of the mix - strand coupling.

It is now given in the following a table showing the various relations among the parameters of the spiral making the device of the sleeper according to the invention, parameters that could be modified according to the specific needing.

$$L \geqq (\sigma_0/400)\,\varnothing$$
$$4 < D/\varnothing < 15$$
$$D > 4\ cm$$
$$D/2 < P < 2D$$
$$20° < \phi < 45°$$
$$1 < D_{min}/D_{max} < 3$$

wherein

- L = spiral length,
- P = spiral pitch,
- D = inner diameter of the spiral
- ϕ = spiral inclination,
- $\varnothing$ = reinforcement element diameter
- σ_0 = steel tension.

The present invention has been described for illustrative, but not limitative purposes, according to its preferred embodiments, but it is to be understood that changes and/or modifications can be introduced by those skilled in the art without departing from the relevant scope as defined in the enclosed claims.

Claims

1. Prestressed concrete railway sleeper provided with a device for increasing the transmission of the stresses between the metallic reinforcement elements and the mix, characterized in that it comprises a high elastic limit steel wire spiral provided coaxially externally around at least one reinforcement element in the zone interested by the transmission of the stresses.

2. Sleeper according to claim 1, characterized in that a positioning element for the spiral is provided concentrically with respect to the reinforcement element during the mix casting.

3. Sleeper according to claim 2, characterized in that said positioning element comprises a shaped bar so as to conform to the profile of the reinforcement element and to fix above and below the spiral.

4. Sleeper according to one of the preceding claims, characterized in that in correspondence of the end portion of the reinforcement element upon which the device of the sleeper is provided, an end element is provided, said element spacing the final part of the mix from the leading end of the spiral.

5. Sleeper according to one of the preceding claims, characterized in that said spiral is made up of zinc plated steel with high elastic limit of stainless steel.

6. Sleeper according to one of the preceding claims, characterized in that said spiral is coaxially provided on two reinforcement elements.

7. Sleeper according to one of the preceding claims, characterized in that the diameter of said spiral is uniform.

8. Sleeper according to one of the preceding claims 1 - 6, characterized in that the diameter of said spiral is variable.

9. Sleeper according to one of the preceding claims, characterized in that the geometrical features of the device are summarised in the following table:

$$L \geqq (\sigma_0/400)\,\varnothing$$
$$4 < D/\varnothing < 15$$
$$D > 4\ \text{cm}$$
$$D/2 < P < 2D$$
$$20° < \phi < 45°$$
$$1 < D_{min}/D_{max} < 3$$

wherein

L =	spiral length,
P =	spiral pitch,
D =	inner diameter of the spiral
ϕ =	spiral inclination,
$\varnothing$ =	reinforcement element diameter
σ_0 =	steel tension.

10. Sleeper according to each one of the preceding claims, substantially as illustrated and described.

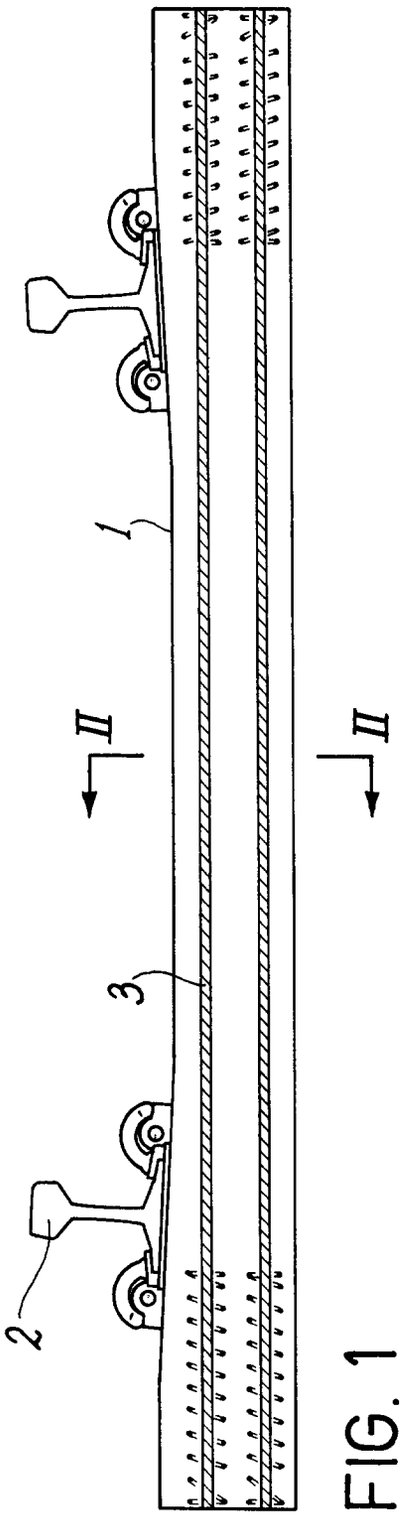


FIG. 1

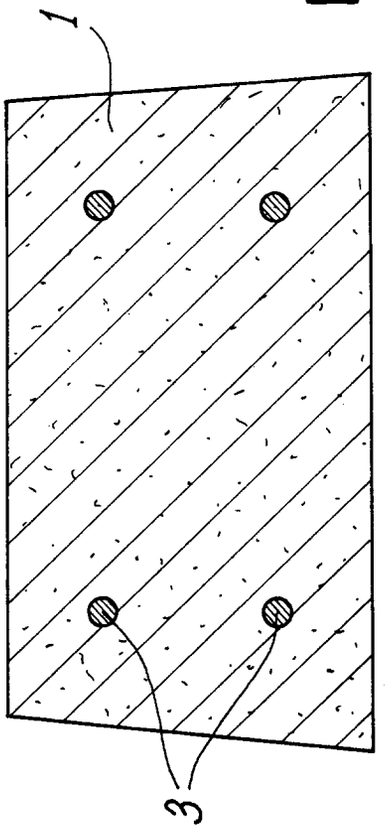
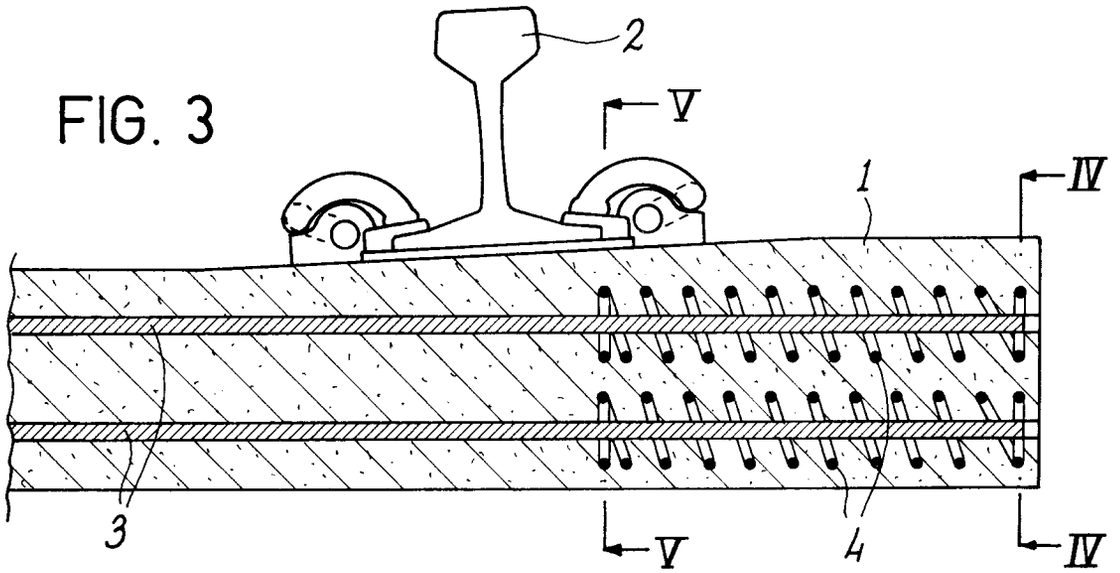


FIG. 2

FIG. 3



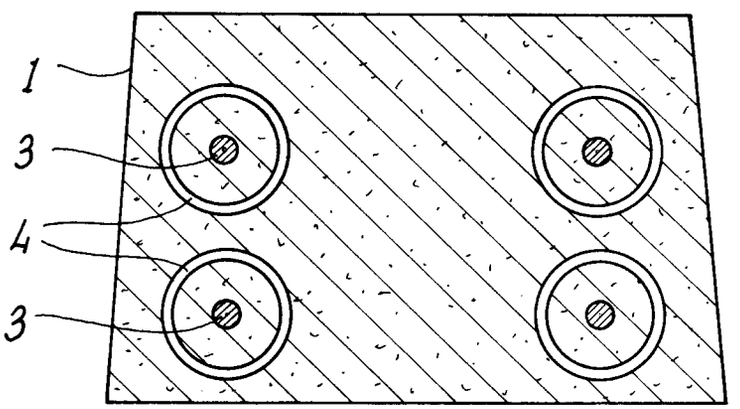


FIG. 4

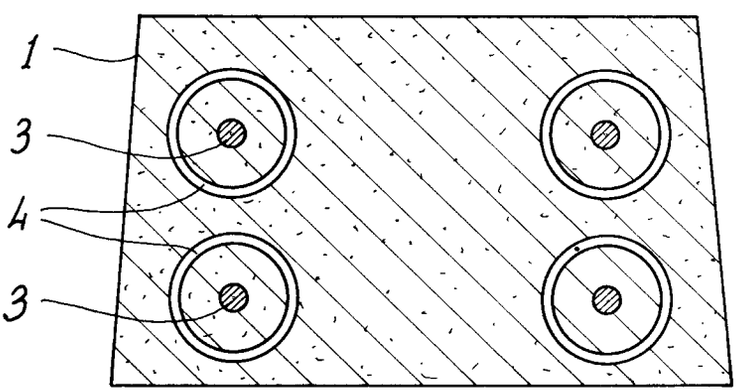


FIG. 5

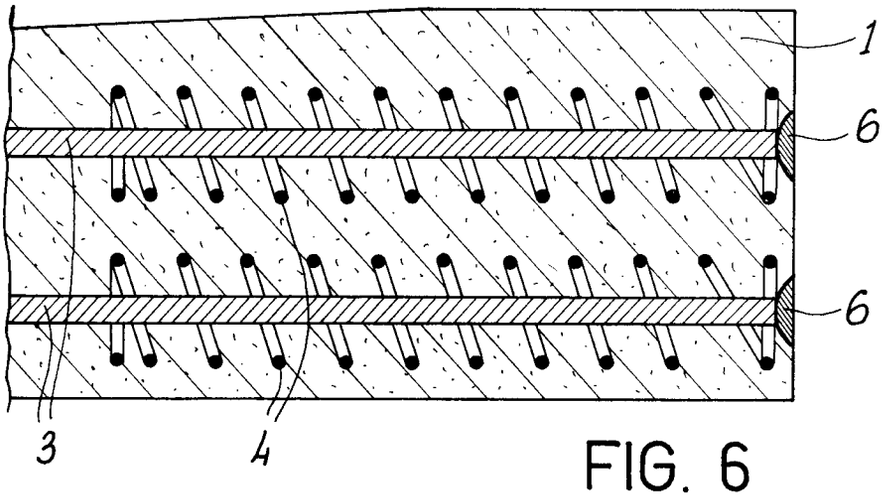


FIG. 6

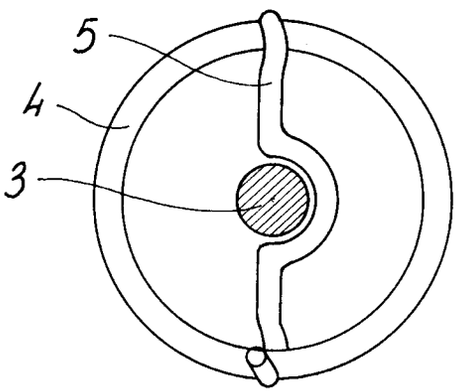
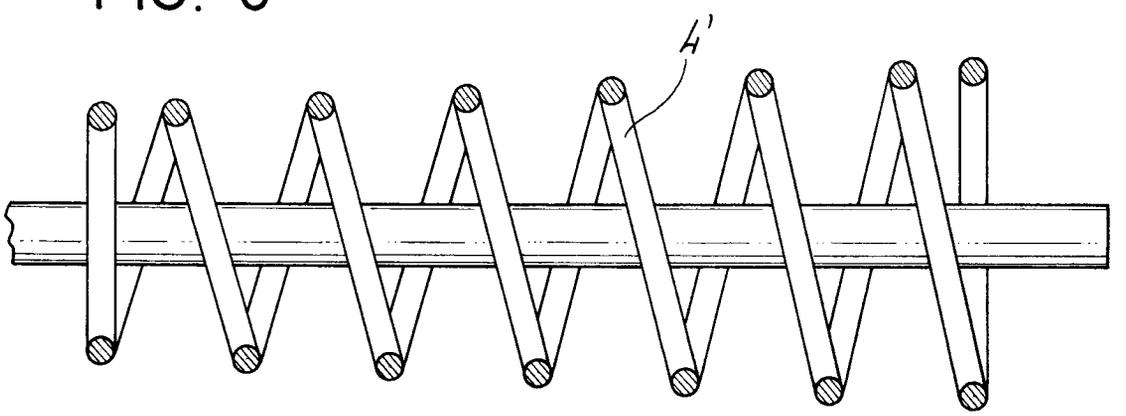


FIG. 7

FIG. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 95 83 0215

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)
X	US-A-3 948 010 (SONNEVILLE ROGER PAUL) 6 April 1976	1,4,7	E01B3/36
A	* column 3, line 52 - column 7, line 49; figures 5-12 *	8,9	
X	FR-A-2 160 789 (LABORDE NOGUEZ BERNARD) 6 July 1973	1,7	
A	* page 2, line 11 - line 40; figures 1-3 *	2,3,8,9	
X	FR-A-2 195 236 (SOCIETE ANONYME DE TRAVERSES EN BETON ARME SYSTEME VAGNEUX) 1 March 1974	1,4,7,9	
A	* page 2, line 35 - page 4, line 29; figures 1-3 *	2,3	
X	FR-A-2 318 273 (FREYSSINET INT STUP) 11 February 1977	1,6,7	
A	* page 2, line 37 - page 3, line 29; figures 1-3 *	2-4,8,9	
A	FR-A-482 788 (VAGNEUX) 26 April 1917 * page 1, line 49 - page 2, line 57; figures 1,2,4,6-8 *	1,2,7	TECHNICAL FIELDS SEARCHED (Int.Cl.6) E01B
X	BE-A-868 553 (YUVAL GAD PIPE MANUFACTURING CO.LTD.) 16 October 1978	1,2,6,7	
A	* page 4, line 28 - page 7, line 23; figures 1-4 *	4,9	
X	BE-A-901 296 (MATTHYNSSENS) 16 April 1985	1,2,7	
A	* page 5, line 14 - page 10, line 11; figures 1,3,4 *	4-6,8,9	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 August 1995	Tellefsen, J

CATEGORY OF CITED DOCUMENTS

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