Description

Title : Support for railway track rails

[0001] The object of the present invention is a support for railway track rails, in particular of the sleeper type, comprising a central core of parallelepipedal appearance formed of at least two juxtaposed slats made of solid wood or wood-based materials, and a protective sheathing coating the said central core, the said protective sheathing being made in one piece, and being formed of a peripheral wall having at least two opposite upper and lower faces and two opposite lateral faces, designed to fit at least the four longitudinal faces of the central core, as well as at least one internal partition extending between two opposite faces or two contiguous faces of said peripheral wall and delimiting with the peripheral wall of the protective sheathing at least two cells each having a shape complementary to a slat of said central core.

[0002] In a known manner, the rail supports, also called track rails supports, concerned by the present invention, such as railway sleepers, bridge parts, engineering structure parts and timbers, participate in the construction of railway tracks, in which, once anchored in a ballast, in addition to serving as a support for the rails, are meant to ensure a constant distance between the latter and to distribute the mechanical loads on the ballast during the passage of a train.

[0003] Railway engineers have always been concerned with designing infrastructures that are reliable, safe and in line with previously defined budgetary constraints. In this context, their studies consist among others in continuously considering new solutions to improve the mechanical performances of the constituent elements of railway tracks, and consequently those of the supports for railway track rails.

[0004] [In this respect, various solutions have been proposed over time to overcome the problems associated with the natural ageing of the raw wood of which railway track supports were made at the beginning of the railway era.

[0005] Thus, to increase their lifespan, it has been proposed to impregnate wooden supports for railway track rails, which are by definition putrescible, with a

protective substance such as creosote, intended to counteract biological attacks from xylophagous agents such as fungi and termites. However, although creosote is still authorized and used today, it is currently strongly contested because of its harmful effects on the environment and human health. The constant evolution of the regulations to which the use of this substance is subject also suggests that it is destined to be phased out. Moreover, it must be noted that the same applies to the new chemical treatments proposed to replace creosote, which still represent a source of environmental pollution, particularly for aquatic environments, and for which it has been observed that the authorizations for use may not be renewed.

[0006] Another solution has consisted of developing supports for railway track rails made of rot-proof material, such as concrete, steel, plastic or composite materials.

[0007] Concrete rail supports are cost-effective, but they are heavy, complex to handle, and fragile due to their rigidity. In addition, they cannot be machined and require the ballast to be raised, which means additional costs. Finally, concrete railway track supports have a high carbon footprint.

[0008] Steel track supports have a long service life. However, they generate noise when trains pass by, which limits the areas where they can be used. Their high electrical conductivity and high maintenance costs, particularly because of the risk of corrosion, are also limiting.

[0009] Available since more recently, track supports made of plastic or composite materials are, like those made of wood, machinable and recyclable, and absorb vibrations and therefore noise. Nevertheless, technical constraints remain, such as their dimensional variations, caused by the thermal expansion of their constituent material. In addition, the material may be subject to creep over time, which may compromise the pull-out strength of the lag bolts. Also, the cost of plastic or composite track supports is high, which is an additional obstacle to their deployment.

[0010] Still to overcome the problem of the rotting of the wood, it has been imagined to design supports for railway track rails in the form of a wooden core coated with

a protective sheathing made of thermoplastic material, the purpose of which is to isolate the wood from any external contact and thus to protect it from any possible biological attacks.

[0011] Documents WO0158663, and WO2016105209 describe railway sleepers, in which the central core is made of a solid piece of wood. However, this configuration presents a non-negligible risk: in case of alteration of all or part of the plastic shell, the whole central core gradually decomposes due to its one-piece structure allowing the propagation of the rot phenomenon from one area to another, which leads to the weakening of the mechanical properties of the considered sleepers.

[0012] Document US4286753 teaches the possibility of designing the central core of a railway sleeper from a juxtaposition of solid wood planks or particle boards, bonded together to form a homogeneous block. However, the disadvantage of the solution described is that it requires the use of potentially harmful and polluting substances such as formaldehyde.

[0013] The purpose of the present invention is to propose a support for railway track rails, such as a railway sleeper, of the type consisting of a central core made of wood or wood-based materials covered with a protective sheathing, having an alternative structure to those already described, making it possible both to overcome all the disadvantages mentioned above and to improve its longevity regarding the effects of the weight of the trains travelling on the railways, while at the same time satisfying the technical, budgetary and environmental criteria currently in force. More precisely, the present invention aims to propose a machinable support for railway track rails, whose life span is extended compared to existing rail supports, which is environmentally friendly, and whose structure and constituent materials allow easy recycling.

[0014] To this end, it is an object of the present invention to provide a support for railway track rails of the kind indicated in the preamble, characterised in that said slats have a plurality of through-holes formed through their thickness e and in that the through-holes of each slat are connected to the through-holes of the adjacent slats by pins of plastic material filling said through-holes.

[0015] In accordance with an advantageous embodiment of the invention, said protective sheathing is made of plastic material.

[0016] In a particular embodiment, said protective sheathing further comprises a pair of caps adapted to cover the left and right end faces of said central core.

[0017] The present invention has also provided that the upper face of said protective sheathing comprises at least two recesses extending symmetrically on either side of a plane passing through the center of said protective sheathing and extending perpendicular to its longitudinal axis.

[0018] Preferably, the recesses have threaded holes.

[0019] According to an advantageous embodiment of the invention, the peripheral wall of said protective sheathing may have a structure forming a set of reliefs and recesses extending over at least a portion of the lower face of its peripheral wall.

[0020] Optionally, the structure forming an array of reliefs and recesses may also extend over at least a portion of the opposite side faces of the peripheral wall of the protective sheathing, said portion extending from the lower face of the peripheral wall towards the upper face thereof.

[0021] Furthermore, the present invention has also provided the feature that said slats are each formed of a series of abutting strips.

[0022] According to a conceivable embodiment, said slats extend parallel to each other and parallel or perpendicular to the upper and lower faces of the peripheral wall of the protective sheathing.

[0023] Alternatively, a structure in which said slats extend parallel to each other and at an angle to the top and bottom faces of the peripheral wall of the protective sheathing is also in accordance with the present invention.

[0024] The advantages of the present invention will become apparent from the following description of the embodiments shown in the accompanying drawings in which:

[0025] [Fig.1] corresponds to a perspective view and in transparency of an embodiment of a support for rails according to the invention, defined here by a railway sleeper,

[0026] [Fig.2] is a perspective view of the central core of the railway sleeper of Figure 1,

[0027] [Fig.3] is a cross-sectional view of the railway sleeper of Figure 1, taken at an alignment of through-holes that the slats of the central core comprise, along one of their transverse edges,

[0028] [Fig.4] shows a partial side view of the railway sleeper of Figure 1,

[0029] [Fig. 5] is a cross-sectional view of a second embodiment of the support for railway track rails according to the invention, and

[0030] [Fig. 6] is a cross-sectional view of a third embodiment of the support for rails according to the invention

[0031] In the embodiment illustrated in Figures 1 to 3, the support for rails according to the invention is defined by a railway sleeper 1 comprising, on the one hand, a central core 2 of parallelepipedal appearance, and, on the other hand, a protective sheathing 4 enveloping said central core 2. The latter is formed here of four slats 3, of thickness e, made of solid wood. However, other configurations can be envisaged, in which the slats 3 are each formed from a series of wooden strips, assembled for example by their respective lateral edges, or by their respective longitudinal edges or face to face after superposition. Furthermore, according to still other configurations, to optimize the cost of the wood material, the mechanical properties, and the durability of the support for rails according to the invention, the different slats 3 of the central core 2 may each be made from different types of wood. For example, it may be possible to produce a central core 2 comprising three inner slats of beech, sandwiched between two outer slats 3 of oak, a material which is by definition more durable and resistant than beech. In other cases, it may be possible to insert the central core 2 between two outer slats made at least partially of polymeric material, and to coat this assembly by the outer sheathing 4.

[0032] In accordance with the invention, the protective sheathing 4 is advantageously in one piece, and is made of plastic or thermoplastic material, reinforced or not with fibers and/or talc, by means of a process known per se, such as, for

example, a plastic injection, extrusion or "exjection" process (registered trademark).

[0033] More precisely, the protective sheathing 4 is formed by a peripheral wall preferably having a thickness e1 of between 5 mm and 15 mm. It has two opposite upper and lower faces 6 and 7, and two opposite lateral faces 8, 9, designed to match at least the four longitudinal faces of said central core 2, as well as two left and right end faces 11, 12, designed to cover the left and right end faces of the central core 2.

[0034] Furthermore, the protective sheathing 4 also comprises three internal partitions 13 parallel to each other, extending between its two opposite lateral faces 8, 9, parallel to its upper 6 and lower 7 faces. Preferably, the internal partitions 13 have a thickness e2 of between 3 mm and 10 mm and, together with the peripheral wall of the protective sheathing 4, delimit four cells 14 each having a shape complementary to a slat 3 of the central core 2.

[0035] In other words, thanks to such a configuration of the railway sleeper 1, each wooden slat 3 of which the central core 2 is made up is housed in an individual protective sheath, defined in each case by a cell 14, and is thus completely separated from the other slats 3. Thus, in the event of any deterioration of the peripheral wall of the protective sheating 4, leading to the exposure of a wooden slat 3 to external agents, only the latter will gradually decompose, without any risk of the phenomenon spreading to the remaining slats 3. Such a characteristic makes it possible to significantly improve the longevity of the railway sleeper 1. Moreover, the alternation of wood and plastic leads to a structure in which the incidence of a possible creep phenomenon of the plastic material is minimized, thus ensuring the solidity of the anchoring of the tie rods intended to fix the rails to the sleeper 1.

[0036] It should also be noted that in order to create a permanent connection across the railway sleeper 1, the slats 3 have a plurality of through-holes 30, formed through their thickness e, and, in the alternative embodiment shown in Figure 2, such that each through-hole 30 of a slat 3 is aligned with a corresponding through-hole 30 of the adjacent slat(s) 3. These through-holes 30 fill with the plastic or thermoplastic material used to encapsulate the slats 3 of the

parallelepipedal core 2 with the protective sheathing 4, during the manufacture of the railway sleepers 1, for example by a plastic injection, extrusion or "exjection" process (trademark). After the plastic material has hardened, the slats 3 are therefore not only each encased in an individual protective sheath, but also connected to each other by pins 31 of plastic material filling the through-holes 30. This last feature prevents the slats 3 from moving relative to each other within the protective sheathing 4, particularly under the effect of the weight of trains travelling on the tracks.

[0037] It should also be noted that, in accordance with the invention, the through-holes 30 are preferably aligned along the longitudinal edge 18 and the transverse edge 19 of each of the slates 3 and in such a way as to be located at a distance d0 of between 5mm and 40mm from the longitudinal edge 18, and at a distance d1 of between 5mm and 70mm from their transverse edge 19. Furthermore, the through-holes 30 of a same slat 3 are regularly spaced apart, preferably by a distance d2 of between 50mm and 200mm.

[0038] On the other hand, with reference to Figures 1 and 3, the upper face 6 of the protective sheathing 4 comprises two recesses 15 extending symmetrically on either side of a plane passing through the center of the protective sheathing 4 and extending perpendicular to its longitudinal axis X. The two recesses 15 are, for example, machined and are each designed to accommodate a metal plate (not shown) for mounting a rail. For this purpose, they are provided with threaded holes 16, extending through the slats 3 and the internal partitions 13 of the protective sheathing 4, intended to receive screws for fixing the metal plate in the recesses 15.

[0039] It should also be noted that in the illustrated embodiment, the bottom 17 of each recess 15 has an inclination suitable for receiving a mounting plate in accordance with current French standards. Of course, the bottom 17 of the recesses 15 could have an inclination different from that illustrated and extend horizontally, for example, in order to be able to accommodate other types of mounting plates.

[0040] As is clear from the above, the rail support according to the invention, such as a railway sleeper 1, defines an alternative solution to those existing to overcome

the problems linked to the putrescible nature of the wood of which they were originally made. Indeed, the watertight protective sheathing 4 which covers the material of which the slats 3 are made makes it possible to preserve it and thus guarantees its durability in accordance with the regulations. Moreover, the rail support according to the invention is simple, economical and ecological to manufacture. It also has the advantage of a longer service life compared to known rail supports in the state of the art, independently of any use of potentially toxic and polluting substances.

[0041] Furthermore, other embodiments than the one illustrated in figures 1 to 3 can also be provided. Thus, a variant of a support for rails defining a railway sleeper 10 has been designed (see Fig. 4), in which the slats 3 form a central core 20, extending parallel to each other and perpendicular to the upper 6 and lower 7 faces of the protective sheathing 4. The alternative embodiment shown in Fig. 5, in which the railway sleeper 100 comprises a central core 200 having two groups of slats 3 extending parallel to each other and at an angle to the upper 6 and lower 7 faces of the protective sheathing 4, the two groups being arranged symmetrically therein with respect to a plane passing through the center of the protective sheathing 4 and extending parallel to its longitudinal axis X, is also in accordance with the spirit of the present invention.

[0042] It should also be noted that according to the manufacturing process used to manufacture the rail support according to the invention, the protective sheathing 4 can be completed with a pair of caps (not illustrated) designed to cover the left 11 and right 12 end faces of the central core 2, 20, 200.

[0043] On the other hand, in order to improve the integration of a support for rails according to the invention, such as a railway sleeper 1, 10, 100, into the ballast of a railway track, the peripheral wall of the protective sheathing 4 can advantageously be designed in such a way that it has a structure forming a set of reliefs and recesses extending over at least a portion of its lower face 7 or even, where appropriate, from its lower face 7 in the direction of its upper face 6, and also over at least a portion of its opposite lateral faces 8, 9.

Claims

[Claim 1] Support for railway track rails (1, 10, 100), in particular of the railway sleeper type, comprising a central core (2) of parallelepipedal appearance formed of at least two juxtaposed slats (3) of thickness e, made of solid wood or wood-based materials, and a protective sheathing (4) covering said central core (2), said protective sheathing (4) being in one piece, and being formed by a peripheral wall having at least two opposite upper (6) and lower (7) faces and two opposite lateral faces (8, 9), designed to fit at least the four longitudinal faces of the central core (2) as well as at least one internal partition (13) extending between two opposite faces or two contiguous faces of the said peripheral wall and delimiting with the peripheral wall of the protective sheathing (4) at least two cells (14) each having a shape complementary to a slat (3) of the said central core (2), characterised in that said slats (3) have a plurality of through-holes formed through their thickness e and in that the through-holes of each slat are connected to the through-holes of the adjacent slats by pins of plastic material filling said through-holes.

[Claim 2] Support for railway track rails (1, 10, 100) according to claim 1, characterized in that said protective sheathing (4) is made of plastic material.

[Claim 3] Support for railway track rails (1, 10, 100) according to any one of the preceding claims, characterized in that said protective sheathing (4) further comprises a pair of caps adapted to cover the left (11) and right (12) end faces of said central core (2).

[Claim 4] Support for railway track rails (1, 10, 100) according to any of the preceding claims, characterized in that the upper face (6) of said protective sheathing (4) comprises at least two recesses (15) extending symmetrically on either side of a plane passing through the center of said protective sheathing (4) and extending perpendicular to its longitudinal axis (X).

[Claim 5] Support for railway track rails (1, 10, 100) according to the preceding claim, characterized in that the recesses (15) comprise threaded holes (16).

[Claim 6] Support for railway track rails (1, 10, 100) according to any one of the preceding claims, characterized in that the peripheral wall of said protective sheathing (4) has a structure forming a set of reliefs and recesses extending over at least a portion of the lower face (7) of its peripheral wall.

[Claim 7] Support for railway track rails (1, 10, 100) according to the preceding claim, characterized in that the structure forming a set of reliefs and recesses also extends over at least a portion of the opposite lateral faces (8, 9) of the peripheral wall of the protective sheathing (4), said portion extending from the lower face (7) of the peripheral wall, in the direction of its upper face (6).

[Claim 8] Support for railway track rails (1, 10, 100) according to any of the preceding claims, characterized in that said slats (3) are each formed of a series of abutting strips.

[Claim 9] Support for railway track rails (1, 10) according to any of the preceding claims, characterized in that said slats (3) extend parallel to each other and parallel or perpendicular to the upper (6) and lower (7) faces of the peripheral wall of the protective sheathing (4).

[Claim 10] Support for railway track rails (100) according to any one of claims 1 to 8, characterized in that said slats (3) extend parallel to each other and at an angle to the upper (6) and lower (7) faces of the peripheral wall of the protective sheathing (4).