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(71) Applicant: **Wegh Group S.p.A.**
43045 Fornovo di Taro (Parma) (IT)

(72) Inventors:
- **MARCHETTI, Tullio**
  24123 BERGAMO (IT)
- **MANZOTTI, Elia**
  24040 PONTIROLO NUOVO (BERGAMO) (IT)

(74) Representative: **Monelli, Alberto**
c/o BUGNION S.P.A
Largo Michele Novaro, 1/A
43121 PARMA ITALY (IT)

(54) RAILWAY SLEEPER

(57) A railway sleeper having a predominant longitudinal extension comprising:
- a first and a second fixing zone (21, 22) of corresponding lengths of rail;
- a first channel (31) which extends along the longitudinal extension; said first channel (31) dividing at least the first fixing zone (21) from the second fixing zone (22).

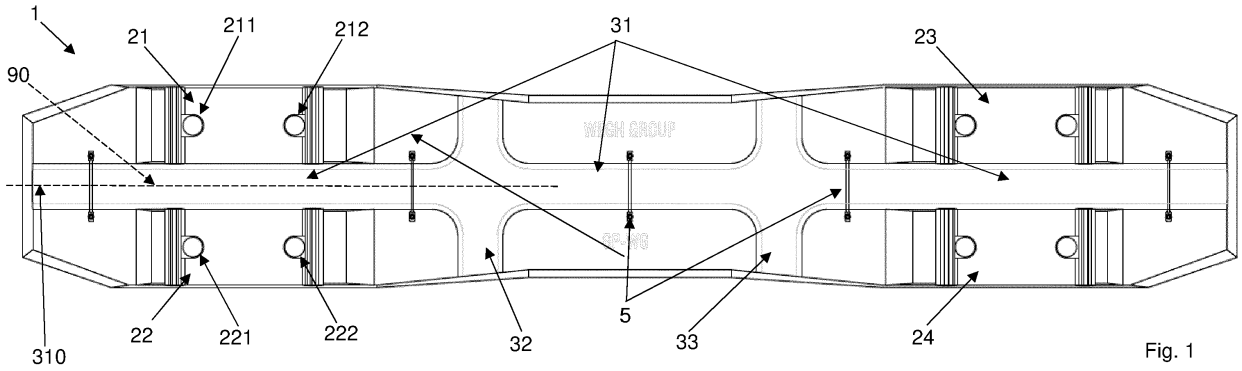

Fig. 1

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Description

[0001] The present invention relates to a railway sleeper and a railway system comprising the sleeper.

[0002] As is known, the transit of train sets along a railway line is assisted by automatic control systems. These, for example, make it possible to understand when a train set passes at a predetermined point on the line. In this regard, it is known to connect a first and a second length of rail side by side and forming part of the same track portion with a current generator. The passage of the train set along this portion of the track allows to close an electrical circuit. In this manner, it is possible to detect the transit.

[0003] A third and a fourth length are located along the railway line consecutively to the first and second length respectively. A first insulating joint is located between the first and the third length. Similarly, a second insulating joint is located between the second and the fourth length. In this manner, when the train set passes, an electrical circuit is closed which involves the first and second length or the third and fourth length and is powered by the current generator.

[0004] To obtain this connection, the use of a first sleeper is known which allows to support the first, second, third, fourth length at the first and second insulating joints. This first sleeper is provided with vertical holes which allow the installation of a first pair of side plates for fixing the first length, a second pair of plates for fixing the second length, a third pair of plates for fixing the third length, a fourth pair of plates for fixing the fourth length. The first and second insulating joints are located above said first sleeper. In this manner, the connection is rigid and robust.

[0005] There are a second and a third sleeper before and after the first sleeper. The second sleeper comprises four conduits completely embedded inside the concrete sleeper. The conduits have an inlet located at one side end of the sleeper and open between the tracks so as to allow the passage of electrical cables intended to electrically connect to the first and second length. The same applies to the third sleeper, through which the electrical cables pass for connection to the third and fourth length. This allows to detect the passage of a train set according to the logic explained above.

[0006] A drawback of this solution is linked to the fact that two different types of sleepers must be used near the joints between consecutive lengths of rail, also different from the standard ones present along the remaining portions of the railway line. This makes installation longer and more expensive. Furthermore, the passage of cables inside the conduits of the sleepers used for this purpose is not easy to carry out, neither during installation nor during maintenance.

[0007] In this context, the technical task underlying the present invention is to propose a railway sleeper which speeds up the installation of the line and reduces costs by reducing the number of types of sleepers required.

[0008] A further object of the present invention is to facilitate the installation, inspection and maintenance of the signalling components.

[0009] The stated technical task and specified objects are substantially achieved by a railway sleeper comprising the technical features set forth in one or more of the appended claims.

[0010] Further features and advantages of the present invention will become more apparent from the illustrative and thus non-limiting description of a preferred but not exclusive embodiment of a railway sleeper, as illustrated in the appended drawings, in which:

- figure 1 shows a top view of a sleeper according to the present invention;
- figure 2 shows a front view of the sleeper of figure 1;
- figure 3 shows a system comprising a sleeper according to the present invention;
- figure 4 shows the system of figure 3 from which some details have been removed;
- figure 5 shows a detail of figure 4.

[0011] In the appended figures, reference number 1 indicates a railway sleeper. This sleeper 1 has a predominant longitudinal extension (this occurs along the direction 9). In particular, the sleeper 1 comprises a first and a second fixing zone 21, 22 of corresponding lengths of rail. The lengths of rail are elements which are not part of the sleeper 1. The sleeper 1 is substantially made of concrete. In particular, the sleeper 1 comprises at least one main concrete body (to which minor elements may be associated, such as, for example, the bridges 5 defined below).

[0012] The first fixing zone 21 comprises a first and a second hole 211, 212 obtained in the sleeper 1. As will be better understood in the following, each of said first and second holes 211, 212 may be associated with a corresponding connecting element with a length of rail. The connecting elements are not part of the sleeper 1 and are engageable respectively in the first and second holes 211, 212 of the first fixing zone 21. The use of two connecting elements allows the length to be clamped from both sides (opposite each other).

[0013] Similarly, the second fixing zone 22 comprises a third and a fourth hole 221, 222. Also in this case it is possible to insert connecting elements in the third and fourth holes 221, 222 of the second fixing zone 22 to constrain a length to the sleeper 1.

[0014] The sleeper 1 comprises a first channel 31 which extends along the longitudinal extension of the sleeper 1 itself. Suitably, the first channel 31 is suitable for the passage of cables. The railway sleeper 1 therefore performs both the function of cable passage and rail support (in a joint area of two consecutive lengths). In particular, the first channel 31 is intermediate between two edges extending along the predominant extension of the sleeper 1 (in particular the first channel 31 extends at half the width of the sleeper 1). The first channel 31 has a section orthogonal to the extension thereof, substan-

tially U-shaped. The first channel 31 therefore defines a groove which projects in height inside the thickness of the sleeper 1. The first channel 31 divides at least the first fixing zone 21 from the second fixing zone 22. In particular, the first and second fixing zone 21, 22 are located in two different half-spaces with respect to an imaginary vertical plane 90 parallel to the direction 9 of predominant extension of the sleeper 1 and passing through the first channel 31 in a zone interposed between the first and second fixing zones 21, 22.

[0015] Suitably, the sleeper 1 comprises a third and a fourth fixing zone 23, 24 of corresponding lengths of rail.

[0016] The first and third fixing zones 21, 23 are located in succession along the predominant longitudinal extension of the sleeper 1 (orthogonal to a direction of advancement of a railway train set along the sleeper 1). Suitably, a middle zone of the sleeper 1 (taken halfway along the longitudinal extension of the sleeper 1 itself) is interposed between the first and third fixing zone 21, 23. In particular, as exemplified in figure 1, the first and third fixing zone 21, 23 are located at two opposite zones of the sleeper 1.

[0017] The second and the fourth fixing zone 22, 24 are located in succession along the predominant longitudinal extension of the sleeper 1. Suitably, said middle zone is intermediate between the second and fourth fixing zone 22, 24. In particular, as exemplified in figure 1, the second and fourth zone 22, 24 are located at two opposite zones of the sleeper 1. The first and second fixing zone 21, 22 define in combination a first laying seat of a rail of the track and of the connecting elements to the sleeper 1. The third and fourth fixing zone 23, 24 define in combination a second laying seat for another rail (and corresponding connecting elements to the sleeper 1) of the same track.

[0018] In the preferred solution, the first channel 31 divides the third fixing zone 23 from the fourth fixing zone 24.

[0019] In particular, the third and fourth fixing zone 23, 24 are located in two different half-planes with respect to an imaginary vertical plane 90 parallel to the direction 9 of predominant extension of the sleeper 1 and passing through the first channel 31 in a zone interposed between the third and fourth fixing zone 23, 24.

[0020] Advantageously, but not necessarily, the first channel 31 is straight. Alternatively, it could extend along the predominant direction 9 of the sleeper 1, for example by defining a snaking or arcuate path. Suitably, the first channel 31 has a slight slope from the longitudinal ends of the sleeper 1 towards an intermediate zone. This facilitates the collection and the run-off of rainwater, avoiding stagnation.

[0021] Advantageously, the first channel 31 extends along the longitudinal extension, connecting two opposite longitudinal ends 41, 42 of the sleeper 1.

[0022] The first channel 31 is intended to pass below both seats of the sleeper 1 intended for supporting the tracks.

[0023] Advantageously, the sleeper 1 comprises a second channel 32 which extends transversally to the first channel 31. In particular, the second channel 32 extends orthogonally to the first channel 31. The second channel 32 is advantageously straight. The second channel 32 crosses from side to side the width of the sleeper 1. The width of the sleeper 1 is measured orthogonally to the direction 9 of predominant longitudinal extension. The width of the sleeper 1 is therefore measured along the direction of extension of the track/railway line located on the sleeper 1. The second channel 32 intercepts the first channel 31. In particular, the first channel 31 intercepts the second channel 32 in an intermediate zone (preferably halfway) of the length of the second channel 32. Thus, the second channel 32 extends in two opposite directions with respect to the first channel 31. Suitably, the second channel 32 has a transverse section at the predominant extension thereof which is substantially U-shaped.

[0024] Suitably, the sleeper 1 also comprises a third channel 33 which extends transversally (preferably orthogonally) to the first channel 31.

[0025] Suitably, the third channel 33 is parallel to the second channel 32. Suitably, the third channel 33 crosses from side to side the width of the sleeper 1. Suitably, the third channel 33 has a section orthogonal to the direction 9 of predominant extension which is substantially U-shaped.

[0026] Suitably, walls of the first and second channel 31, 32 are radiused at the intersection between the first and second channel 31, 32. Similarly, walls of the first and third channel 31, 33 are radiused at the intersection between the first and third channel 31, 33.

[0027] The second channel 32 is nearer to the first and the second fixing zone 21, 22 than the third channel 33.

[0028] The third channel 33 intercepts the first channel 31. In particular, the first channel 31 intercepts the third channel 33 in an intermediate zone (preferably halfway) of the length of the third channel 33. Thus, the third channel 33 extends in two opposite directions with respect to the first channel 31.

[0029] Advantageously, the sleeper 1 may comprise a plurality of bridges 5 positioned straddling the first and/or second and/or third channel 31, 32, 33. Such bridges 5 minimise the risk of accidental extraction of cables from the first and/or second and/or third channel 31, 32, 33. These cables are electrical cables. Within the present description, electrical cables are intended as power cables. In a particular solution, however, cables for transmitting an electrical signal could also be considered.

[0030] Such bridges 5 overlap the first and/or second and/or third channel 31, 32, 33 by connecting two opposite sides (between which the first and/or second and/or third channel 31, 32, 33 are located). Such bridges 5 are for example plastic or metal clamps. The ends of these bridges 5 are embedded in the sleeper 1.

[0031] The bridges 5 are preferably connected to the sleeper 1 by bushings or another fixing system. They can

also be removed to allow the installation and maintenance of the cables.

[0032] Suitably the first, second and third channel 31, 32, 33 extend seamlessly. Suitably the first and/or second and/or third channel 31, 32, 33 have an opening facing upwards. Suitably the first and/or second and/or third channel 31, 32, 33 extend without coverage for at least 90% of the extension thereof.

[0033] Further subject matter of the present invention is a system 10 comprising a sleeper 1 having one or more of the features described hereinabove.

[0034] Suitably, the system 10 comprises a first rail 11. The first rail 11 comprises a first and a second length 111, 112 consecutive to one another along a predominant direction of extension of the first rail 11.

[0035] The system 10 comprises first connecting means 15 of the first length 111 to the sleeper 1. The first connecting means 15 is constrained to the sleeper 1 in said first fixing zone 21. The first connecting means 15 suitably comprises an anchor which allows it to be inserted into the first hole 211 located in the first fixing zone 21. Thus, the first length 111 is connected in the first fixing zone 21. The first connecting means 15 comprises a support comprising a base portion which rests on the first fixing zone 21, a portion which extends between the top and bottom (substantially vertically) and two eyelets. A flap of the first length 111 remains interposed between the base portion and the eyelets and is therefore stably constrained. Preferably, the first connecting means 15 comprises a pair of supports each comprising: a base portion resting on the first fixing zone 21, a portion extending between the top and bottom (substantially vertically) and two eyelets. Of the two pair supports, one connects to the first hole 211 of the first fixing zone 21 and one connects to the second hole 212 of the first fixing zone 21.

[0036] The system 10 suitably comprises second connecting means 16 of the second length 112 to the sleeper 1. The second connecting means 16 is constrained to the sleeper 1 in the second fixing zone 22. In particular, the second connecting means 16 comprises an anchor projecting into the third hole 221 in the second fixing zone 22.

[0037] The second length 112 is thus connected to the sleeper 1 in said second fixing zone 22. Suitably, what is described with reference to the first connecting means 15 of the first length 111 with the first fixing zone 21 can be repeated for the second connecting means 16 of the second length 112 with the second fixing zone 22.

[0038] Suitably, the system 10 comprises a first electrically insulating joint 13 interposed between the first and second length 111, 112. Suitably, the first electrically insulating joint 13 has a section corresponding to that of the section of the first and second length 111, 112. Suitably, said first joint 13 is located above the sleeper 1. Furthermore, the first joint 13 is located above the first channel 31. The first joint 13 is suitably glued between the first and the second length 111, 112.

[0039] Suitably, the system 10 comprises a second rail 12 comprising a third and a fourth length 121, 122 consecutive to one another.

[0040] The system 10 comprises third connecting means 18 of the third length 121 to the sleeper 1. The third connecting means 18 is constrained to the sleeper 1 in said third fixing zone 23. The third connecting means 18 suitably comprises a third anchor which allows it to be inserted in a hole located in the third fixing zone 23. The third length 121 is thus connected to the sleeper 1 in said third fixing zone 23.

[0041] The system 10 comprises fourth connecting means 19 of the fourth length 122 to the sleeper 1. The fourth connecting means 19 is constrained to the sleeper 1 in the fourth fixing zone 24. The fourth connecting means 24 suitably comprises a fourth anchor which allows them to be inserted in a hole located in the fourth fixing zone 24.

[0042] Suitably, the first and the third length 111, 121 define a first portion 101 of a railway track 100. The first and the third length 111, 121 are in fact side by side and parallel, belonging to two distinct rails. The second and the fourth length 112, 122 define in combination a second portion 102 of the railway track 100 (this second portion 102 is consecutive to the first portion 101). The second and the fourth length 112, 122 are side by side and parallel and belong to two distinct rails.

[0043] Suitably, the system 10 also comprises determination means 14 for determining the passage of a train along the first and/or the second portion 101, 102 of the railway track 100.

[0044] The passage determination means 14 comprises a plurality of (electrical) cables 17 passing through the first channel 31 and electrically connected partly to the first length 111, partly to the second length 112, partly to the third length 121 and partly to the fourth length 122.

[0045] The first channel 31 comprises an inlet 310 through which said plurality of cables 17 runs.

[0046] This inlet 310 is suitably obtained at one end of the sleeper 1. This inlet 310 is defined by an end of the first channel 31.

[0047] As already explained above, the sleeper 1 comprises the second channel 32. The second channel 32 extends transversally to the first channel 31 and crosses from side to side the width of the sleeper 1. Similarly, the sleeper 1 also comprises the third channel 33. The third channel 33 extends transversally to the first channel 31 and crosses from side to side the width of the sleeper 1. The second channel 32 is interposed between the third channel 33 and the first fixing zone 21. The second channel 32 is nearer to the first fixing zone 21 than the third channel 33.

[0048] A first part 171 of said plurality of cables 17 runs through the second channel 32; they derive however from the first channel 31. They are introduced into the sleeper 1 through the inlet 310. In particular, the first part of the cables 17 branches into two branches of the second channel 32. Those directed to the first length 111 will be

housed in one branch, those directed to the second length 112 will be housed in the other branch. Suitably, a second part 172 of said plurality of cables 17 runs in the third channel 33.

[0049] Also in this case, the second part 172 of said plurality of cables 17 branches into two branches of the third channel 33 depending on whether they are directed to the third or fourth length 121, 122.

[0050] The means 14 for determining the passage of a train suitably comprises one or more sensors connected to the first, second, third and fourth length 111, 112, 121, 122, suitably via the cables 17. These sensors allow detecting an electrical signal associated with the passage of a train set.

[0051] In one solution, the means 14 for determining the passage of a train could comprise means for supplying power to the first, second, third, and fourth length 111, 112, 121, 122. Suitably, a passing train closes the electrical circuit between the first and third length 111, 121 thus allowing a sensor to detect the passage of current and thus the passage of the train.

[0052] The present invention achieves important advantages.

[0053] Firstly, it allows to optimise the geometry of the sleeper 1. This is reflected in the fact that the sleeper thus modified can adequately support the joint area between two consecutive lengths of track and at the same time allows easy inspection and maintenance of suitable electrical cables, for example for detecting the passage of a train.

[0054] The invention as it is conceived is susceptible to numerous modifications and variants, all falling within the scope of the inventive concept characterised thereby. Furthermore, all the details can be replaced with other technically equivalent elements. In practice, all the materials used, as well as the dimensions, can be any according to requirements.

Claims

1. A railway sleeper having a predominant longitudinal extension comprising a first and a second fixing zone (21, 22) of corresponding lengths of rail;
   characterised in that it comprises a first channel (31) which extends along the longitudinal extension; said first channel (31) dividing at least the first fixing zone (21) from the second fixing zone (22); said first channel (31) being suitable for passage of cables.

2. The sleeper according to claim 1, **characterised in that** it comprises a third and a fourth fixing zone (23, 24) of corresponding lengths of rail;

   the first and the third fixing zone (21, 23) are located in succession along the longitudinal extension of the sleeper (1);
   the second and the fourth fixing zone (22, 24) are located in succession along the longitudinal extension of the sleeper (1).

3. The sleeper according to claim 2, **characterised in that** the first channel (31) divides the third fixing zone from the fourth fixing zone (23, 24).

4. The sleeper according to any one of the preceding claims, **characterised in that** the first channel (31) extends along the longitudinal extension of the sleeper (1), connecting two opposite longitudinal ends (41, 42) of the sleeper (1).

5. The sleeper according to any one of the preceding claims, **characterised in that** it is substantially made of prestressed reinforced concrete.

6. The sleeper according to any one of the preceding claims, **characterised in that** it comprises:

   - a second channel (32) which extends transversally to the first channel (31) and crosses from side to side the width of the sleeper (1);
   - a third channel (33) which extends transversally to the first channel (31) and crosses from side to side the width of the sleeper (1); said second channel (32) being nearer to the first and the second fixing zone (21, 22) than the third channel (33); the second and the third channel (32, 33) intercepting the first channel (31).

7. The sleeper according to any one of the preceding claims, **characterised in that** it comprises a plurality of bridges (5) positioned straddling the first channel (31).

8. A system comprising:

   - a sleeper (1) according to one or more of claims from 2 to 5;
   - a first rail (11) comprising a first and a second length (111, 112) consecutive to one another along a preponderant direction of extension of the first rail (11);
   - first connecting means (15) of the first length (111) to the sleeper (1), said first connecting means (15) being constrained to the sleeper (1) in said first fixing zone (21);
   - second connecting means (16) of the second length (112) to the sleeper (1), said second connecting means (16) being constrained to the sleeper (1) in said second fixing zone (22);
   - a first electrically insulating joint (13) interposed between the first and second length (111, 112), said first joint (13) being located above the sleeper (1);
   - a second rail (12) comprising a third and a fourth length (121, 122) consecutive to one an-

other; the first and the third length (111, 121) defining a first portion (101) of a railway track (100); the second and the fourth length (112, 122) defining, in combination, a second portion (102) of the railway track (100);
- determination means (14) for determining the passage of a train along the first and/or the second portion (101, 102) of the railway track (100), said determination means (14) of the passage comprising a plurality of cables (17) running in the first channel (31) and which are electrically connected partly to the first length (111), partly to the second length (112), partly to the third length (121), and partly to the fourth length (122).

9. The system according to claim 8, **characterised in that** said first channel (31) comprises an inlet (310) through which said plurality of cables runs (17).

10. The system according to claim 8 or 9, **characterised in that** the sleeper (1) comprises a second and a third channel (32, 33) which extend transversally to the first channel (31) and cross from side to side the width of the sleeper (1); said second channel (32) being interposed between the third channel (33) and the first fixing zone (21);
a first part (171) of said plurality of cables (17) running in said second channel (32); a second part (172) of said plurality of cables (17) running in said third channel (33).

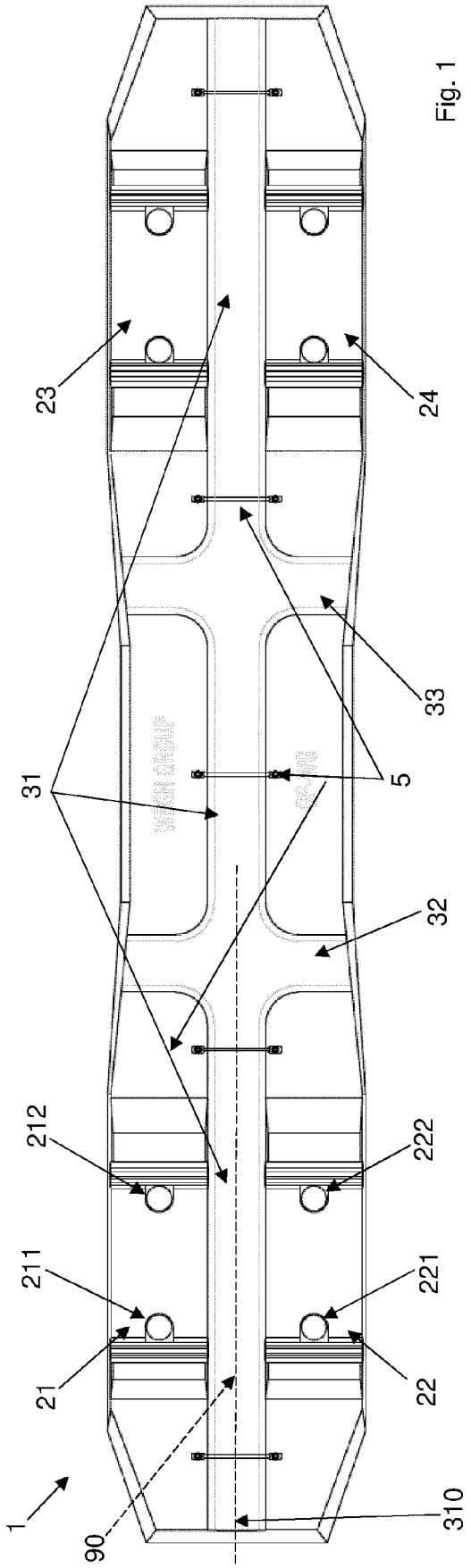


Fig. 1

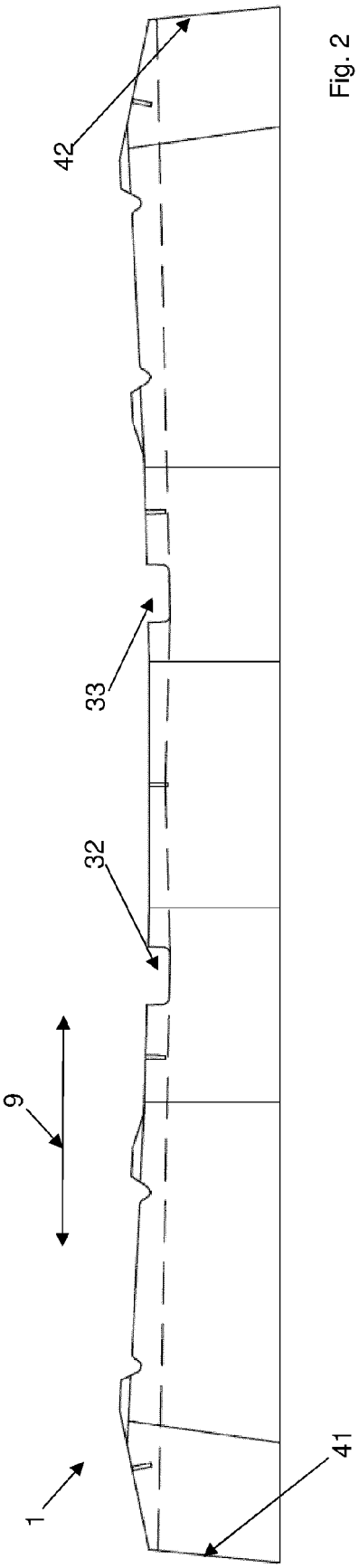


Fig. 2

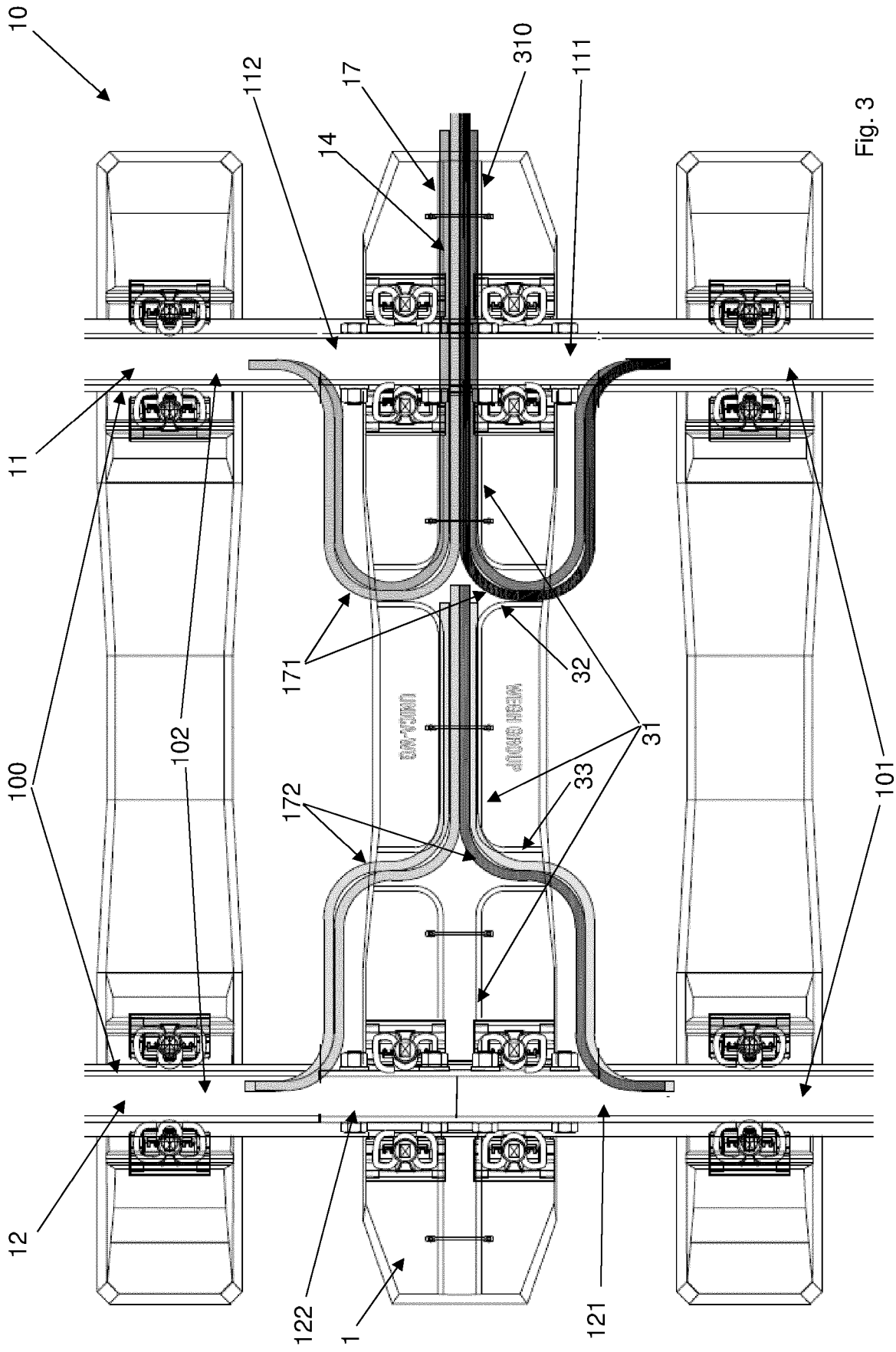
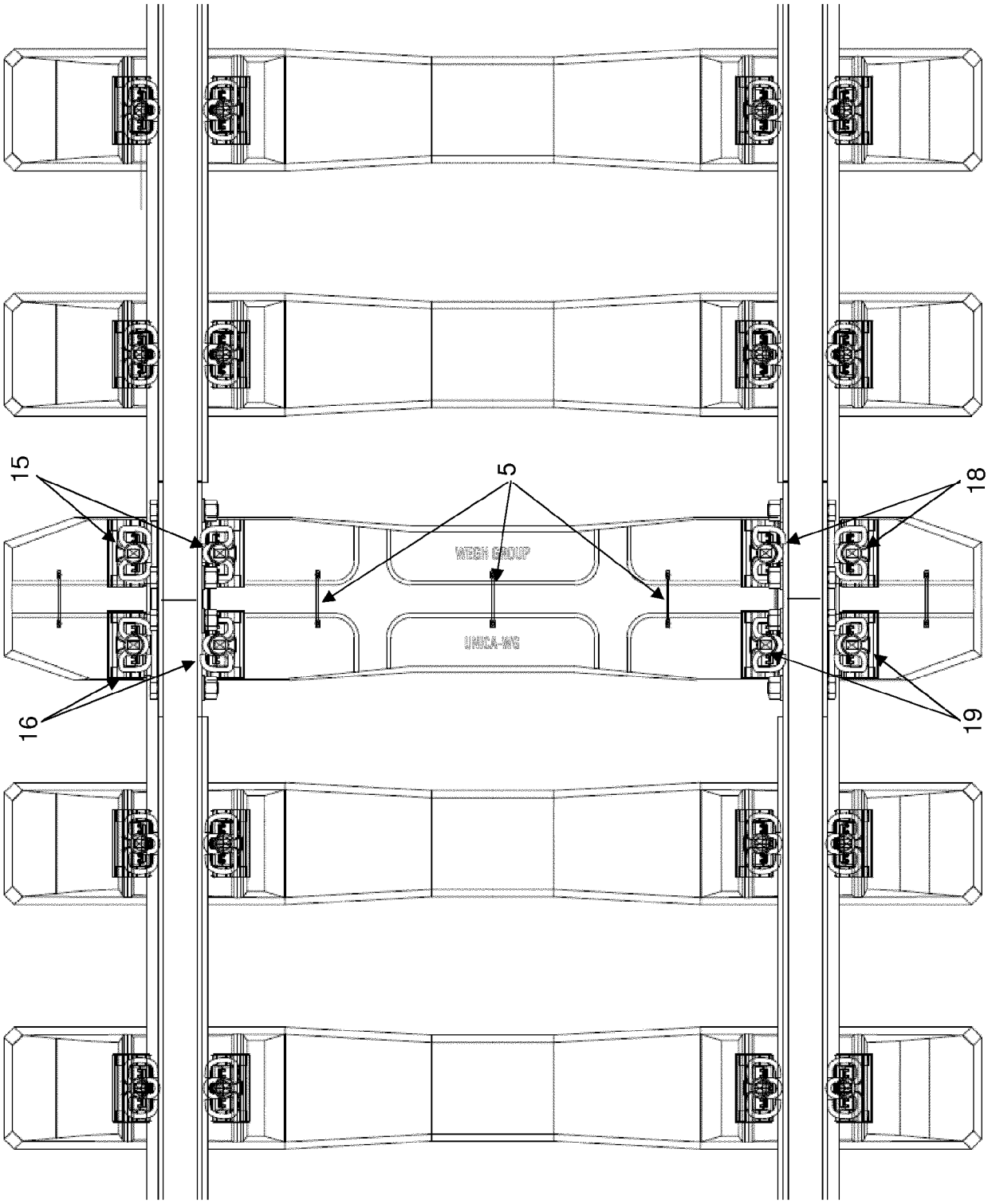


Fig. 3

Fig. 4



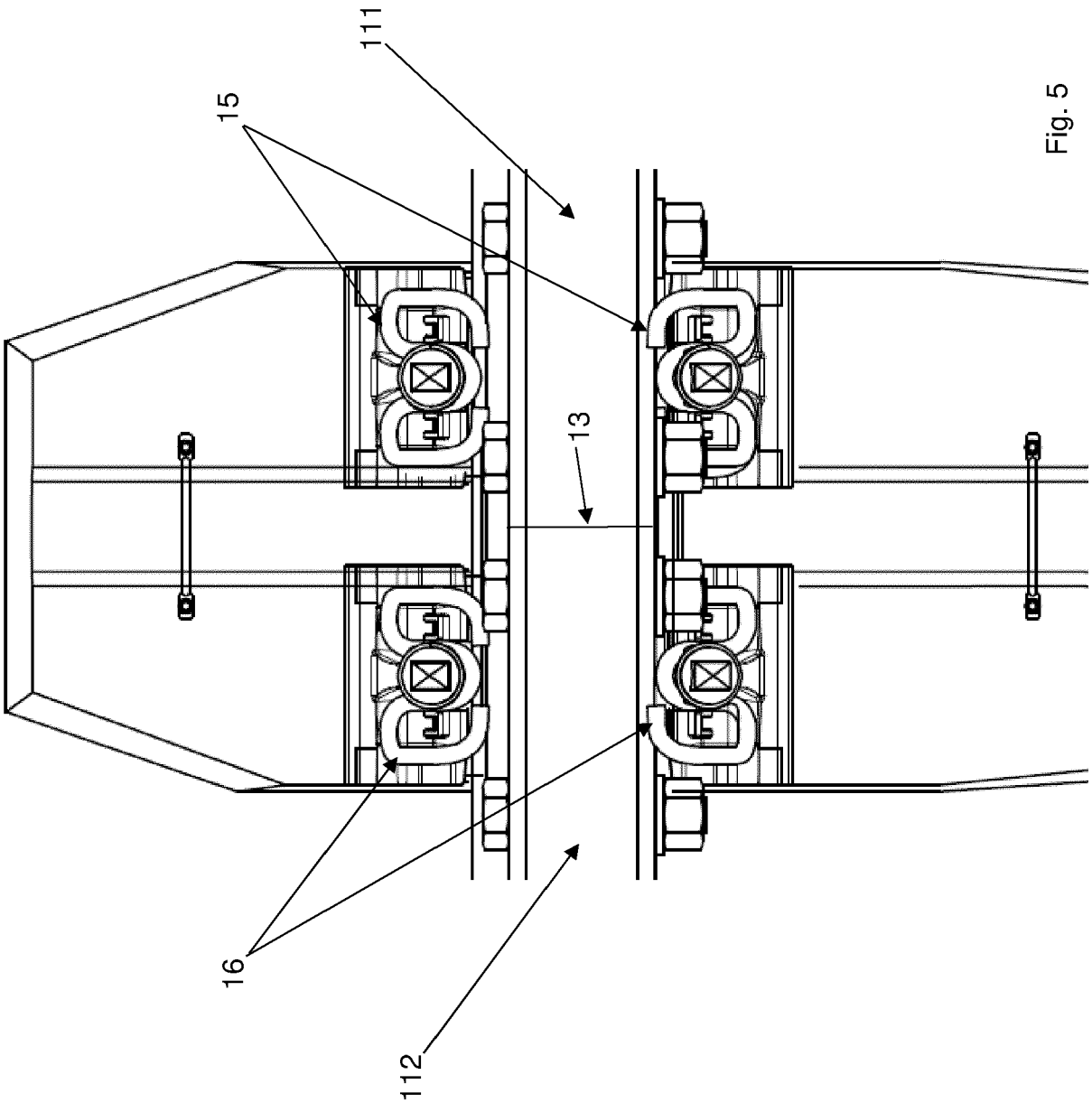


Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 20 20 2692

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	CN 203 716 004 U (MENG ZHIGANG; XU JIAKANG; YANG TAI; PAN JINGUI) 16 July 2014 (2014-07-16) * figures; examples *	1-5	
X	JP H06 53601 U (JAPANESE) 22 July 1994 (1994-07-22) * claims; figures 5,11 *	1,2,7	
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TECHNICAL FIELDS SEARCHED (IPC)
E01B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 January 2021	Movadat, Robin

CATEGORY OF CITED DOCUMENTS

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