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(71) Applicant: **Seoul Metropolitan Subway Corporation**
Seocho-gu, Seoul (KR)

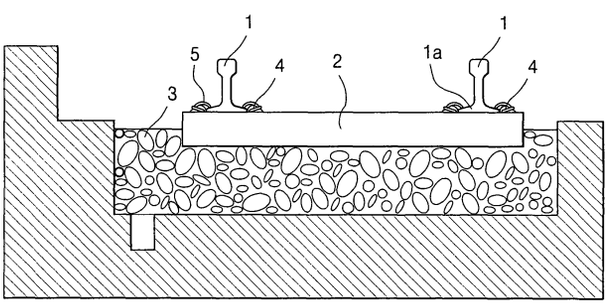
(72) Inventors:
- **Kim, Sang Jin**
  Nowon-gu, Seoul (KR)
- **Chung, Sung Min**
  Nowon-gu, Seoul (KR)

(74) Representative: **Dr. Weitzel & Partner**
Friedenstrasse 10
89522 Heidenheim (DE)

(54) Railroad concrete ballast construction system and method

(57) The railroad concrete ballast construction system and method are disclosed, which are capable of constructing a concrete ballast (70) at a certain section of a gravel ballast having no gravel and rail tie (20) for exchanging a certain section of a gravel ballast (3) with a new concrete ballast (70) in a state that a train currently runs on a railroad, curing and disassembling a structure adapted to fix a rail for a stable operation of a train for thereby effectively finishing an exchanging work. The railroad concrete ballast construction system includes a concrete rail tie slab engaged at a rail (10) of a certain section having no gravels and rail ties in a gravel ballast, a rail support unit (30) for supporting a vertical weight applied to the rail during an operation of the train and preventing a sagging of the rail, a gauge tie rod (40) for preventing an elongation of the rail when a concrete of the slab is constructed, a gauge strut (50) for preventing a contraction of the rail when a concrete of the slab is constructed, a horizontal support member (60) for maintaining a horizontal state of the rail when a concrete of the slab is constructed, and a concrete ballast for constructing the slab on the ground using a concrete supplied through an inlet formed at the slab.

Fig.1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a railroad concrete ballast construction system and method capable of exchanging a certain section of a gravel ballast track with a new concrete ballast track even when a train currently runs on a railroad, and in particular to a railroad concrete ballast construction system and method capable of constructing a concrete ballast at a certain section of a gravel ballast having no gravel and rail tie for exchanging a certain section of a gravel ballast with a new concrete ballast in a state that a train currently runs on a railroad, curing and disassembling a structure adapted to fix a rail for a stable operation of a train for thereby effectively finishing an exchanging work.

2. Description of the Background Art

[0002] Generally, the ballast has been used for widely distributing a weight transferred through a rail and rail tie, and transferring to a ground, resulting in a reduction of the weight. In addition, the ballast is capable of preventing a rail tie movement occurring due to a contraction and elongation of a rail by a temperature change based on a ballast resistance force for thereby absorbing a vibration of a train and enhancing an absorbing effect.

[0003] In addition, a drainage operation is enhanced in cooperation with the ballast, and it is possible to effectively prevent the growth of weeds. Therefore, the gravels that have the above functions and are easily obtained, have been widely used as a material of the ballast.

[0004] As shown in Figure 1, the gravel ballast includes a rail 1 that supports train wheels, a rail tie 2 that is formed of a concrete rail tie or a wooden rail tie for transferring a weight or impact from the rail 1 to the ground when a train runs on a rail road, a gravel ballast 3 that is provided between the ground and the rail tie 2 for thereby absorbing the weight transferred thereto, and a clamp 5 of which one end is engaged with a fixture 4 fixed at the rail tie 2, an intermediate portion supports a flange 1 a of the rail 1, and the other end supports the fixture 4 wherein the clamp 5 is designed with three support points in an E-shape.

[0005] The above gravel ballast has an advantage of uniformly distributing the weight transferred through the rail 1 when the train runs to the ground. However, the gravels of the gravel ballast 3 may be broken and worn away, thus producing small gravel pieces. In this case, the function of the ballast is significantly decreased and the safety factor of the train operation is decreased, thereby causing an accident.

[0006] In the case that the gravels of the gravel ballast 3 are disappeared and broken into small gravels, the absorbing effect becomes decreased, and it is needed to continuously refill the gravels into the gravel ballast 3. Therefore, additional workers and time are needed, so that a maintenance cost is increased. In this case, it is impossible to perform the work for filling the gravels into the gravel ballast 3 when the train runs.

[0007] Recently, in order to overcome the above problems, a concrete ballast has been constructed. And also the gravel ballast is now exchanging with a concrete ballast.

[0008] However, in order to exchange the gravel ballast with a concrete ballast, it is needed to stop the running of the train. In this case, many conveniences are caused to passenger. In addition, an exchanging work is performed during a nighttime in which the operation of the train is stopped. In this case, workers have too much workload due to a bad work environment. As a result, workability is decreased.

SUMMARY OF THE INVENTION

[0009] Accordingly, it is an object of the present invention to provide a railroad concrete ballast construction system and method capable of enhancing a workability efficiency in such a manner that a certain section of a gravel ballast is exchanged with a concrete ballast when a train currently runs on a railroad.

[0010] It is another object of the present invention to provide a railroad concrete ballast construction system and method capable of significantly reducing a workload of a worker in such a manner that an exchanging work can be performed during a night without causing any convenience with respect to a train passenger by exchanging a gravel ballast with a concrete ballast when a train runs on a railroad.

[0011] To achieve the above objects, there is provided a railroad concrete ballast construction system, comprising a concrete rail tie slab in which a mounting part formed at both sides is engaged at a certain section having no gravel and rail tie on a gravel ballast track by a certain fixture; a rail support unit that is detachably installed between opposite slabs, and supports a vertical weight applied to a rail when a train runs, and supports the rail on the ground for thereby preventing the rail from being sagged; a gauge tie rod of which both ends are fixed at a rail support upper plate and an intermediate portion is flexible, for thereby preventing an elongation of the rail when a concrete of the slab is constructed; a gauge strut of which both ends are fixed at an inner surface of a body of the rail and an intermediate portion is flexible, for thereby preventing a contraction of the rail when a concrete of the slab is constructed; a horizontal support member that is installed outside the rail to be on the same line as the gauge strut, and supports an outer surface of the body of the rail and maintains a horizontal state of the rail when a concrete of the slab is constructed; and a concrete ballast that fixes the slab

on the ground in cooperation with the concrete constructed between the ground and the slab through an inlet formed at the slab.

[0012] In the present invention, receiving groove is formed at an outer surface of the slab so that the rail support unit is disassembled from the slab and is pulled out in an outer direction after the concrete is cured.

[0013] The concrete rail tie slab includes a mounting part that is protruded from the left and right sides of an upper surface of the slab in opposite directions wherein the rail is mounted thereon; an engaging part that is engaged with an engaging hole formed at the left and right sides of the mounting part and has a certain elastic force capable of supporting a flange of the inner and outer sides of the rail; and an assistant engaging part that is engaged with a through hole formed at the slab in an outer direction of the mounting part and is embedded when a concrete is constructed for thereby enhancing an engaging force of the slab.

[0014] The concrete rail tie slab is formed of a steel-reinforced concrete structure of which a tensional force is reinforced using steel bars embedded.

[0015] To achieve the above objects, there is provided a railroad rail concrete ballast construction method, comprising the steps of removing gravels and rail ties from the ground and the rail in a certain section of a gravel ballast track; engaging a concrete rail tie slab at a lower side of a flange of the rail using a certain fixture; supporting the rail on the ground using a rail support unit installed between the opposite slabs for thereby preventing a sagging of the rail by supporting a vertical weight applied to the rail when a trains runs on the railroad; preventing an elongation of the rail using a gauge tie rod of which both ends are fixed at a rail support upper plate, when a concrete is constructed; preventing a contraction of the rail using a gauge strut of which both ends are fixed at an inner surface of a body of the rail, when a concrete of the slab is constructed; maintaining a horizontal state of the rail, when a concrete of the slab is constructed, by a horizontal support member installed outside the rail to be the same line as the gauge strut; fixing the slab on the ground using a concrete constructed between the ground and the slab through an inlet formed at the slab; and disassembling the rail support unit, the gauge tie rod, the gauge strut and the horizontal support member after the concrete is cured.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The present invention will become better understood with reference to the accompanying drawings which are given only by way of illustration and thus are not limitative of the present invention, wherein;

Figure 1 is a cross sectional view illustrating a gravel ballast of a conventional railroad;

Figure 2 is a schematic plan view illustrating a railroad concrete ballast construction system according to the present invention;

Figure 3 is a schematic view illustrating a state that a gravel and rail tie are removed, and a rail is supported in a certain section of a gravel ballast in which a railroad concrete ballast construction system according to the present invention is adapted;

Figure 4 is a schematic view illustrating a state that a concrete rail tie slab is installed at a lower side of a rail according to the present invention;

Figure 5 is a schematic view illustrating a state that a concrete is constructed between the ground and a slab of Figure 4;

Figure 6 is a cross sectional view illustrating a slab according to the present invention; and

Figure 7 is a flow chart of a work process of a railroad concrete ballast construction system according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] As shown in Figures 2 through 6, a railroad concrete ballast construction system according to the present invention includes a concrete rail tie slab 20 in which a mounting unit 21 is engaged at a rail 10 by a certain fixture in a certain section of a gravel ballast track having no gravel and rail tie wherein a train can run on a railroad; and a rail support unit 30 that is installed so that it is disassembled between the opposite slabs 20 and is designed to support a vertical weight applied to the rail 10 when the train runs and the weight of the rail 10 at the ground for thereby preventing the rail 10 from being sagged.

[0018] The rail support unit 30 may be preferably formed of a hydraulic jack, a screw jack, a rack jack, etc.

[0019] The concrete rail tie slab 20 may be preferably formed of a reinforced concrete (RC) of which a tensional force is reinforced by an embedded reinforcing bar (not shown).

[0020] In addition, there are further provided a gauge tie rod 40 of which both ends are fixed to an upper plate 80 and an intermediate part is flexible so that it is possible to prevent the rail 10 from being elongated when concrete is constructed or a train runs; and a gauge strut 50 of which both ends are fixed to an inner surface of a body 11 of the rail 109 and an intermediate portion is flexible for thereby preventing the rail from being contracted when the concrete of the slab 20 is constructed.

[0021] There are further provided a horizontal support member 60 that is installed outside the rail 10 to be on the same line with the gauge strut 50 and supports an outer side of the body 11 of the rail 10 for thereby maintaining a horizontal state of the rail when the concrete of the slab 20 is constructed; and a concrete ballast 70 that fixes the slab 20 on the ground based on the concrete constructed between the ground and the slab 20 through an inlet 22 formed at the slab 20.

[0022] Here, the concrete rail tie slab 20 includes a

mounting part 21 that is protruded from the left and right sides of the upper surface of the slab 20 in opposite directions wherein the rail 10 is mounted thereon; an engaging part 25 that is engaged to an engaging hole 24 formed at the left and right sides of the mounting part 21 and has an elastic force and is fixed by an engaging bolt B supporting a flange 12 at the inner and outer sides of the rail 10; and an assistant engaging part 27 that is engaged with a through hole 26 formed at the slab 20 at the outer side of the mounting part 21 for thereby enhancing an engaging force of the slab 20 when the concrete is constructed.

[0023] A receiving groove 23 is formed at an outer surface of the slab 20 so that the rail support part 30 is disassembled from the slab 20 in an outer direction after the concrete is cured.

[0024] In the drawing, reference numeral 90 represents an anti-vibration member that is installed at the lower side of the flange 20 of the rail 10 for thereby absorbing impacts and vibrations, and 100 represents a driving motor for driving a pair of levers 103 and 104 when a driving shaft 102 is rotated for thereby preventing the rail 10 from being sagged by a support part 101.

[0025] The operation of the railroad concrete ballast construction system according to the present invention will be described.

[0026] As shown in Figure 7, the gravels and rail ties are removed from the ground and the rail 10 in a certain section of the gravel ballast track on which the train can run in a step S100. At this time, the rail 10 in the section having no gravel and rail tie is installed with a certain gap from the ground.

[0027] As shown in Figure 3, the concrete rail tie slab 20 is engaged to a lower side of the flange 12 of the rail 10 using a certain fixture in a step S200. The slab 20 is moved by a certain lifting equipment such as a crane, etc. and is inserted between the rail 10 and the ground.

[0028] On the ground, the rail 10 is supported by the rail support unit 30 installed between the opposite slabs 20 for thereby preventing the rail 10 from being sagged by supporting a vertical weight applied to the rail 10 when the train runs during a working time in a step S300.

[0029] At this time, the rail support unit 30 may be formed of a hydraulic jack, a screw jack, etc. The method for driving the rail support unit 30 and supporting the rail 10 is a known art, so that the detailed description thereon will be omitted.

[0030] A mold 200 is installed around the rail support unit 30 for thereby preventing the concrete from being inputted into the surrounding portions of the rail support unit 30 when constructing the concrete. The portions corresponding to the mold 200 is finished with cement after the concrete is cured.

[0031] Here, the gauge tie rod 40 of which both ends are fixedly supported by the rail support upper plate 80 and an intermediate part is flexible is adapted to prevent the rail 10 from being elongated when the concrete of the slab 20 is constructed in a step S400.

[0032] The gauge strut 50 of which both ends are fixedly supported by the rail support upper plate 80 and an intermediate portion is flexible is adapted to prevent the rail 10 from being sagged when the concrete is constructed in a step S500.

[0033] The horizontal support member 60 that is installed outside the rail 10 to be at the same line with the gauge strut 50 wherein an intermediate portion of the same is flexible is adapted to maintain a horizontal state of the rail 10 when the concrete of the slab 20 is constructed in a step S600.

[0034] The concrete supplied between the ground and the slab 20 through the inlet 22 formed at the center of the slab 20 constructs the slab 20 on the ground in a step S700. At this time, the concrete is constructed with a certain height including the height of the slab 20 for thereby enhancing a support force.

[0035] The rail support unit 30, the gauge tie rod 40, the gauge strut 50 and the horizontal support member 60 are disassembled from the rail 10 after the concrete ballast 70 is cured (generally after 3~5 days) in a step S800.

[0036] As described above, in the case that the work for exchanging a part of the gravel ballast with a concrete ballast is performed, since the rail 10 is supported by a plurality of the rail support part 30 in a state that the rail tie and gravel are removed from the lower side of the rail 10, it is possible to prevent the rail 10 from being sagged wherein the rail 10 is sagged due to a vertical weight from the rail 10 when the train runs.

[0037] In addition, the slab 20 is designed to prevent the rail 10 from being sagged by the tie rod 40 when the concrete is constructed, and the strut 50 is designed to prevent the rail 10 from being contracted, and the horizontal support member 60 is designed to maintain a horizontal state of the rail.

[0038] Therefore, in the present invention, it is possible to prevent the sagging and contraction of the rail 10 at a certain section even when the train runs during the working time for thereby continuously performing the gravel ballast exchanging work, so that it is possible to significantly enhance the workability.

[0039] As described above, the railroad concrete ballast construction system according to the present invention has the following advantages.

[0040] In the present invention, it is possible to continuously perform a work for exchanging a certain section of the gravel ballast with a concrete ballast even when the train runs on the railroad for thereby enhancing a workability.

[0041] In addition, in the present invention, since the gravel ballast can be exchanged with a concrete ballast during the operation of the train, any inconvenience is not provided to train passenger. The work for exchanging the gravel ballast with a concrete ballast can be performed during a day time, resulting in a better work environment. Therefore, work time is significantly decreased, and workers have less workload.

[0042] As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described examples are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the meets and bounds of the claims, or equivalences of such meets and bounds are therefore intended to be embraced by the appended claims.

Claims

1. A railroad concrete ballast construction system, comprising:

a concrete rail tie slab in which a mounting part formed at both sides is engaged at a certain section having no gravel and rail tie on a gravel ballast track by a certain fixing means;
a rail support unit that is detachably installed between opposite slabs, and supports a vertical weight applied to a rail when a train runs, and supports the rail on the ground for thereby preventing the rail from being sagged;
a gauge tie rod of which both ends are fixed at a rail support upper plate and an intermediate portion is flexible, for thereby preventing an elongation of the rail when a concrete of the slab is constructed;
a gauge strut of which both ends are fixed at an inner surface of a body of the rail and an intermediate portion is flexible, for thereby preventing a contraction of the rail when a concrete of the slab is constructed;
a horizontal support member that is installed outside the rail to be on the same line as the gauge strut, and supports an outer surface of the body of the rail and maintains a horizontal state of the rail when a concrete of the slab is constructed; and
a concrete ballast that fixes the slab on the ground in cooperation with the concrete constructed between the ground and the slab through an inlet formed at the slab.

2. The system of claim 1, wherein a receiving groove is formed at an outer surface of the slab so that the rail support unit is disassembled from the slab and is pulled out in an outer direction after the concrete is cured.

3. The system of either claim 1 or claim 2, wherein said concrete rail tie slab includes:

a mounting part that is protruded from the left and right sides of an upper surface of the slab in opposite directions wherein the rail is mounted thereon;
an engaging part that is engaged with an engaging hole formed at the left and right sides of the mounting part and has a certain elastic force capable of supporting a flange of the inner and outer sides of the rail; and
an assistant engaging part that is engaged with a through hole formed at the slab in an outer direction of the mounting part and is embedded when a concrete is constructed for thereby enhancing an engaging force of the slab.

4. The system of either claim 1 or claim 2, wherein said concrete rail tie slab is formed of a steel-reinforced concrete structure of which a tensional force is reinforced using steel bars embedded.

5. A railroad rail concrete ballast construction method, comprising:

removing gravels and rail ties from the ground and the rail in a certain section of a gravel ballast track;
engaging a concrete rail tie slab at a lower side of a flange of the rail using a certain fixing means;
supporting the rail on the ground using a rail support unit installed between the opposite slabs for thereby preventing a sagging of the rail by supporting a vertical weight applied to the rail when a trains runs on the railroad;
preventing an elongation of the rail using a gauge tie rod of which both ends are fixed at a rail support upper plate, when a concrete is constructed;
preventing a contraction of the rail using a gauge strut of which both ends are fixed at an inner surface of a body of the rail, when a concrete of the slab is constructed;
maintaining a horizontal state of the rail, when a concrete of the slab is constructed, by a horizontal support member installed outside the rail to be the same line as the gauge strut;
fixing the slab on the ground using a concrete constructed between the ground and the slab through an inlet formed at the slab; and
disassembling the rail support unit, the gauge tie rod, the gauge strut and the horizontal support member after the concrete is cured.

Fig.1

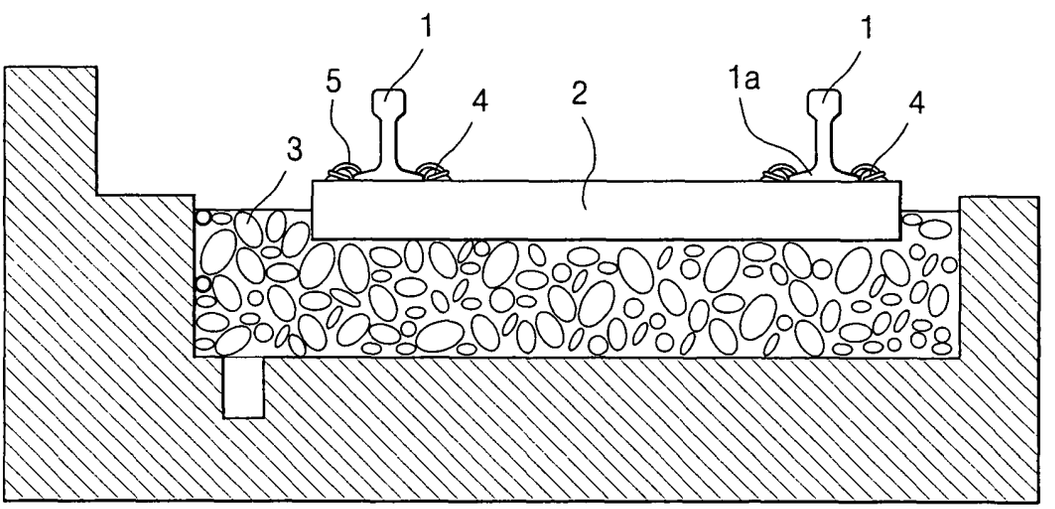


Fig.2

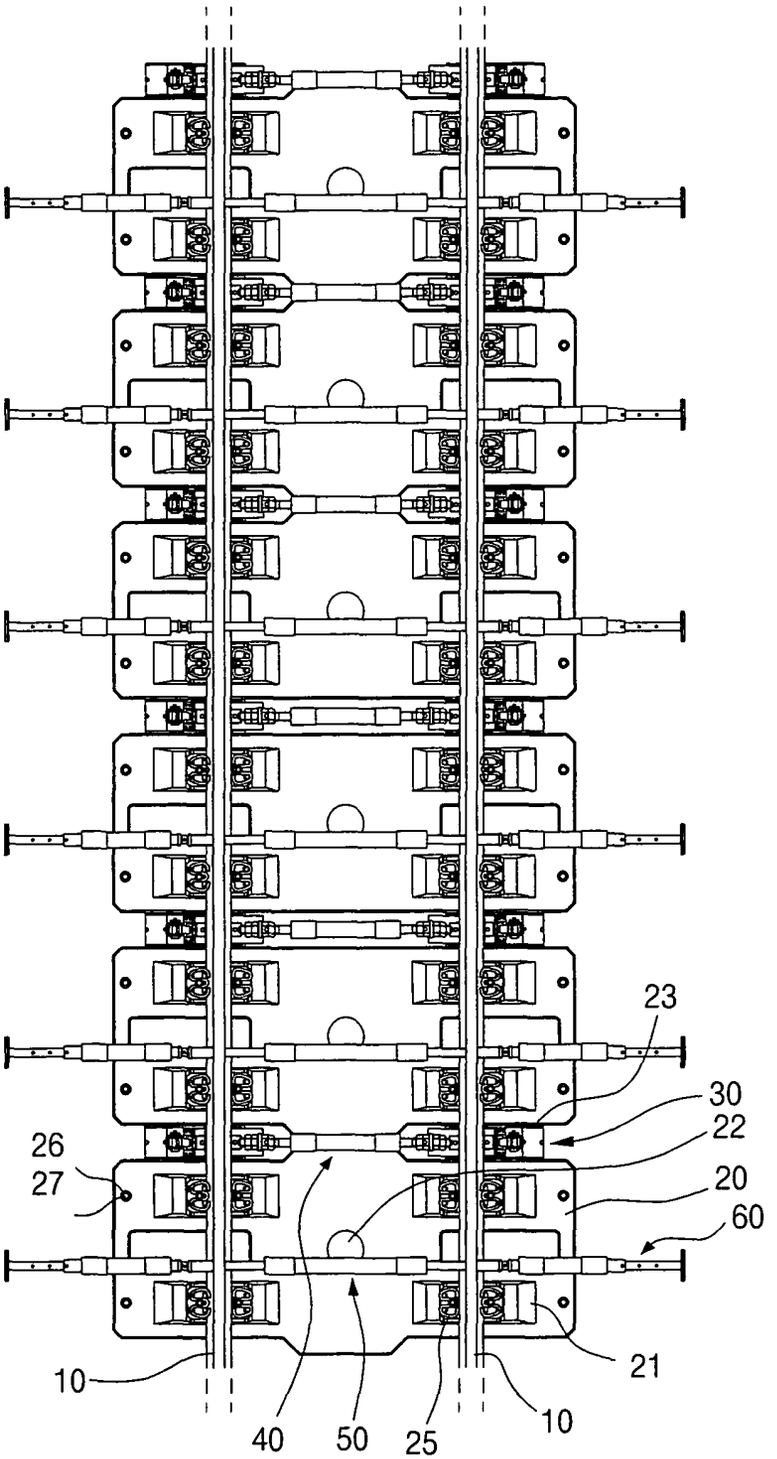


Fig.3

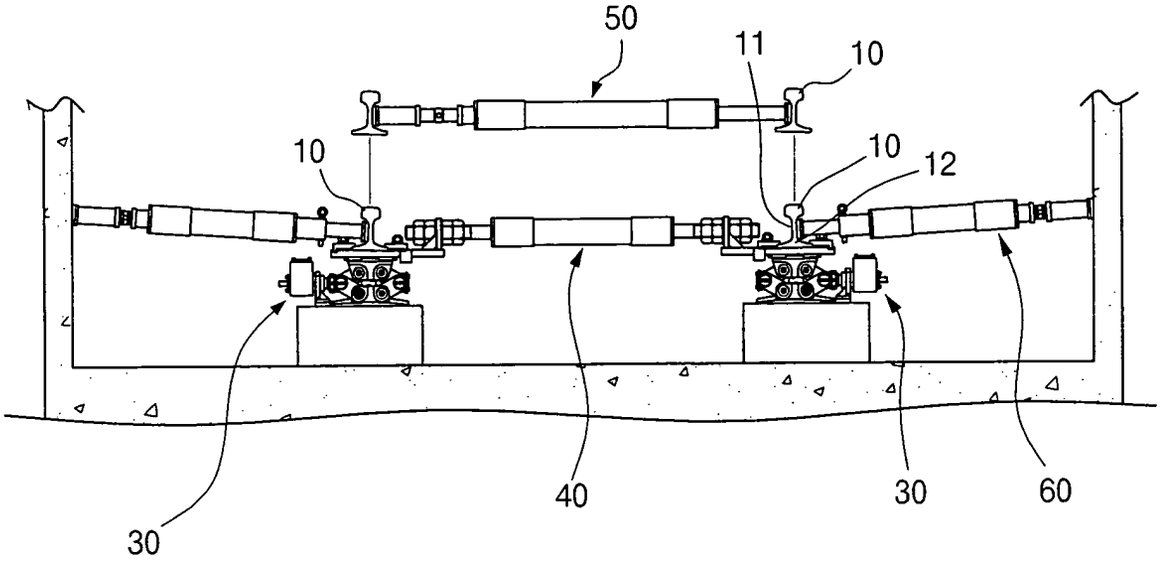


Fig.4

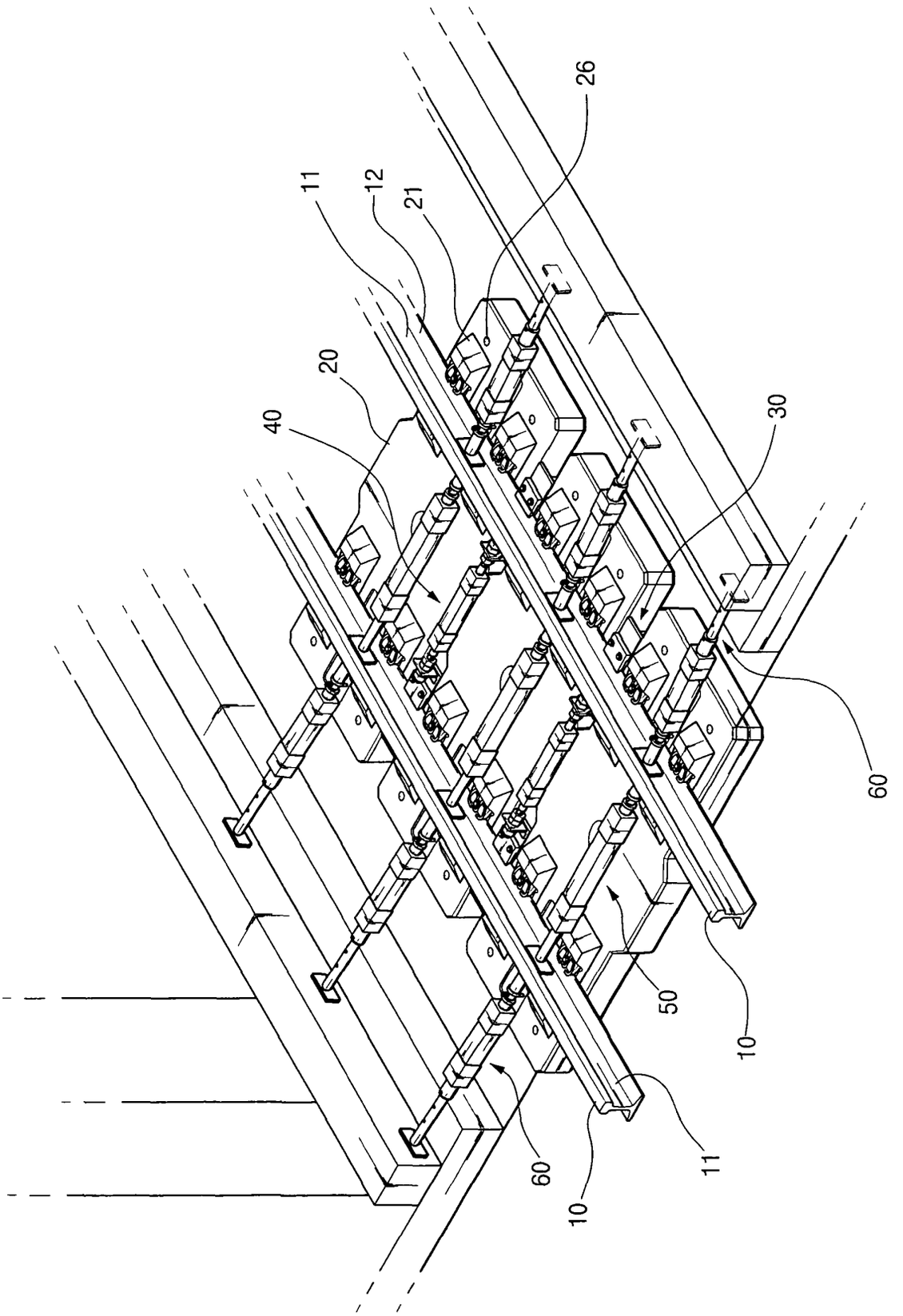


Fig.5

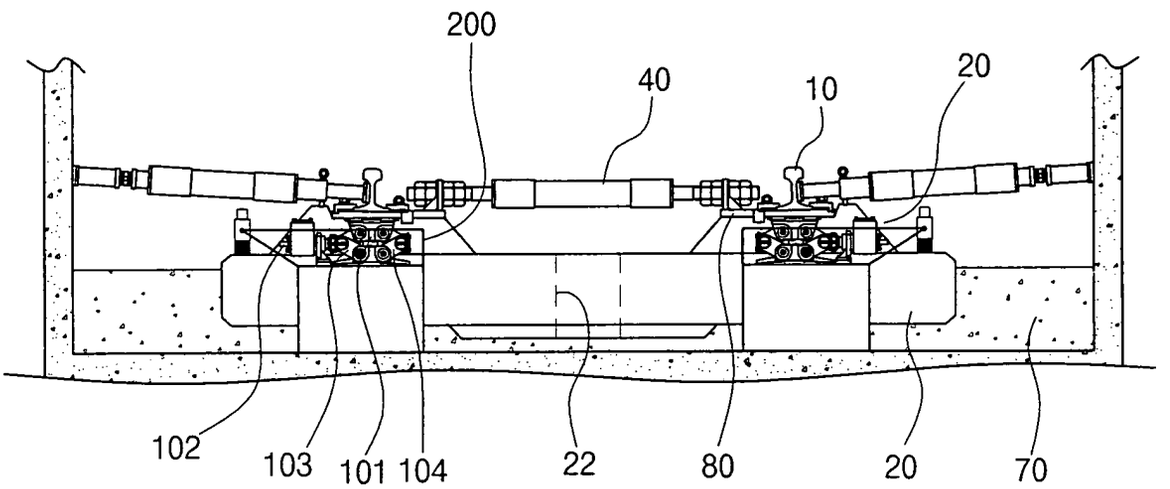


Fig.6

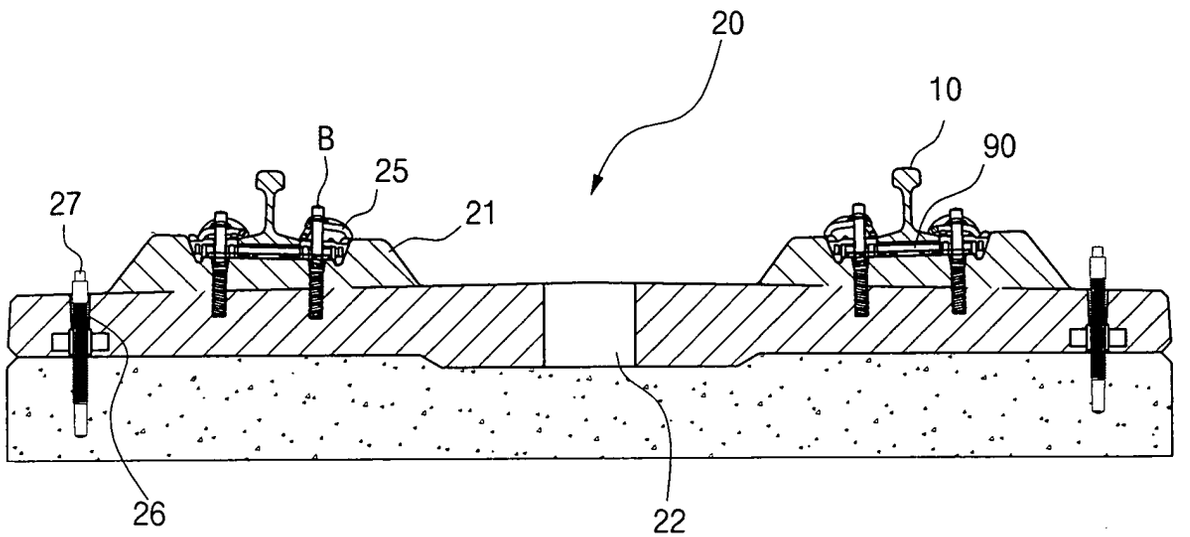
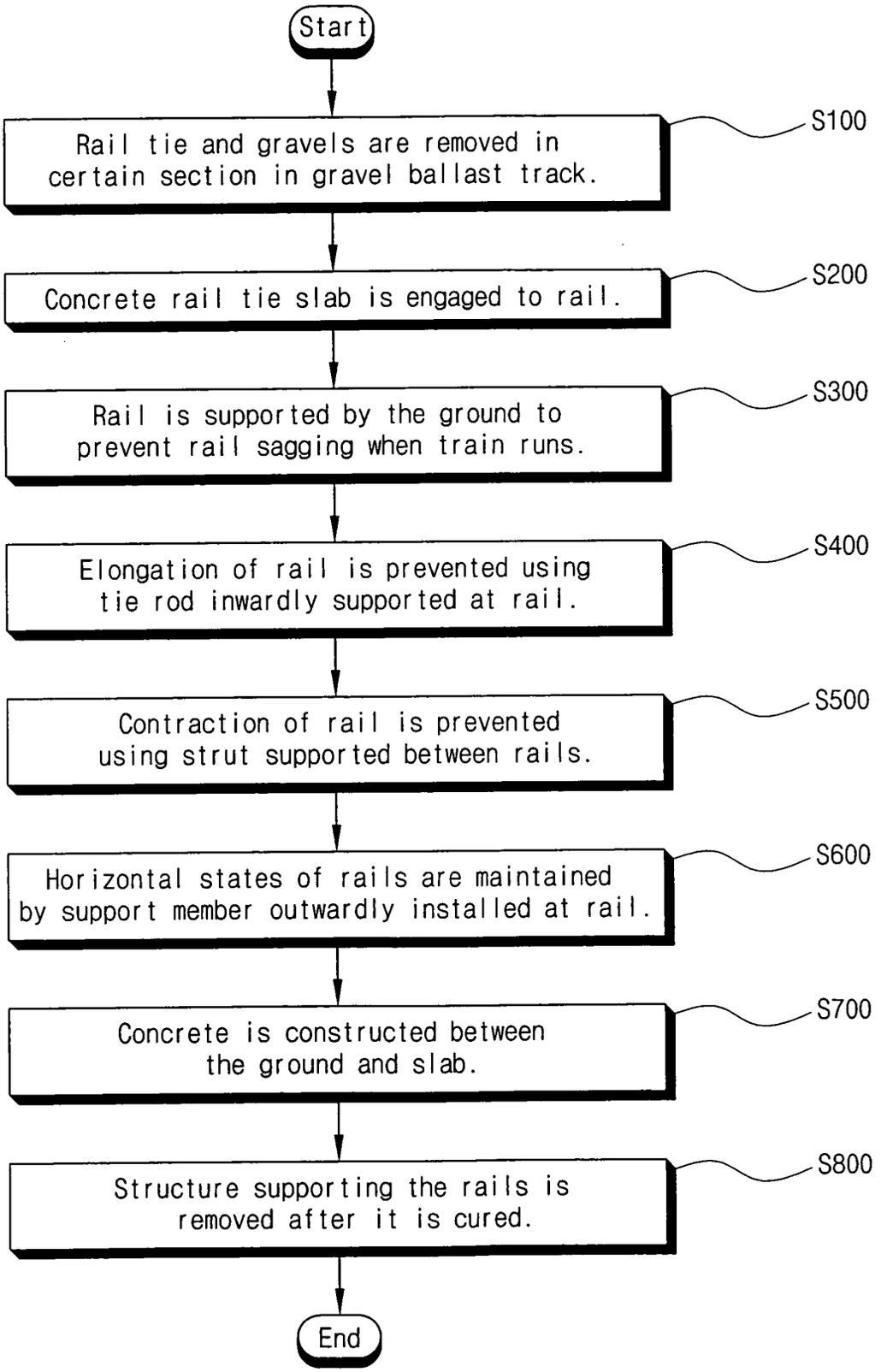


Fig.7


Start
Rail tie and gravels are removed in certain section in gravel ballast track.
S100
Concrete rail tie slab is engaged to rail.
S200
Rail is supported by the ground to prevent rail sagging when train runs.
S300
Elongation of rail is prevented using tie rod inwardly supported at rail.
S400
Contraction of rail is prevented using strut supported between rails.
S500
Horizontal states of rails are maintained by support member outwardly installed at rail.
S600
Concrete is constructed between the ground and slab.
S700
Structure supporting the rails is removed after it is cured.
S800
End