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(54) **IMPROVEMENTS IN OR RELATING TO TRACKS FOR RAILWAY TYPE VEHICLES**

VERBESSERUNGEN AN ODER IN BEZUG AUF BAHNANLAGEN FÜR SCHIENENFAHRZEUGE

AMELIORATIONS APPORTEES AUX VOIES POUR VEHICULES DE TYPE FERROVIAIRE

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Description

Description of Invention

[0001] This invention relates to tracks for railway type vehicles such as trains and trams.

[0002] Conventionally tracks have comprised a pair of rails on which the vehicle wheels run, the rails being supported in spaced relationship by sleepers on a base. The sleepers conventionally have rested on a base of ballast.

[0003] Such conventional tracks require frequent maintenance as the motion of vehicles tends to settle the ballast resulting in the rails becoming out of level and line.

[0004] It has been proposed to provide a track pavement in a settable material such as concrete or macadam, and to lay the rails on the pavement. The rails have been secured relative to the pavement either on sleepers which each support a pair of rails, or on discrete blocks for individual rails, which sleepers or blocks have been secured to the pavement e.g. by grouting. Alternatively the rails have been secured to the pavement by an elastic adhesive. The pavement has been supported on a prepared base.

[0005] A track pavement provides an advantage over conventional arrangements in which rails are supported on ballast, in terms of reduced maintenance as loadings imposed on the track as a train or other railway vehicle travels along the track, and particularly peak loadings, are dissipated into the base by the pavement.

[0006] However there are .drawbacks too, not in the least the necessity for the pavement accurately to be laid so that the rails subsequently supported by the pavement conform to the track engineer's specification of line, level and rail positions. Once laid, it is very difficult to modify the pavement subsequently, for examples to realign the track and/or to change the cant of the track.

[0007] Another substantial problem is to lay the pavement when only short interruptions in normal railway traffic (possessions) can be tolerated. Ideally a roadway is required adjacent the site where the track is to be provided to allow for delivery of materials for laying the pavement. Alternatively it is necessary to use an adjacent track as a delivery route for materials, which may be acceptable for laying new track, but presents substantial difficulties where possession time available may be short. When forming a pavement on site there may be insufficient time for the concrete/macadam or other material which is laid to produce the pavement, to set.

[0008] It has been proposed in US-A-3382815 and EP-A-0555616 to provide a track pavement using preformed concrete sections but in each case, after the sections are laid considerable work and therefore time is required to prepare the pavement to receive rails.

[0009] According to a first aspect of the invention we provide a track for railway vehicles according to claim 1.

[0010] Thus a track may be provided which has all the advantages of a track having a track pavement, but the track may be installed simply and quickly, even where only short possessions are available. The pre-formed sections can be conveniently delivered by road or by a delivery vehicle using an adjacent track and lifted into position from the lorry or railway delivery vehicle using a suitable crane or other lifting means.

[0011] By virtue of each pre-formed section including ballast, levelling of the rails laid on the pavement may be facilitated. Of course to prevent the ballast spilling from the pre-formed sections e.g. as they are lifted into place from a delivery vehicle, the ballast retaining means is required. This may be a temporary closure means which is removed as the section is laid and connected to an adjacent section may be provided, or a ballast glue.

[0012] Most conveniently the sections are generally of channel shape comprising a base in which the rails are supported, and a pair of upstands. Thus the upstands, or at least one of the upstands, may be used for various purposes such as for example only, to accommodate services, such as pipes and/or cables, in which case the upstand may include a suitable hollow such as a duct or pathway for such services.

[0013] The hollow may be open or may be closed by a cover.

[0014] Alternatively or additionally, the upstands or other part of the pre-formed sections may be adapted, e.g. with opening or supporting formations, to support a sign, sensor and the like.

[0015] The pre-formed sections may be adapted to support sound deflecting or sound absorbing or sound attenuating members e.g. baffles, which reduce sound emanating from the rail interface with the wheels of a railway vehicle.

[0016] To prevent the, particularly but not exclusively channel shaped, pre-formed sections becoming waterlogged, the pre-formed sections may be formed such that precipitation drains from the sections when laid. The or at least some of the pre-formed sections may be provided with drainage means which permit water to flow from the pavement, e.g. to the side of the foundation on which the pavement is laid, or to a drain.

[0017] To enable the sections conveniently and quickly to be coupled together, the pre-formed sections may include coupling means to facilitate their coupling to adjacent pre-formed sections. However the sections may rely on running rails spanning several sections to connect the sections together.

[0018] To prevent the concrete or other material from which the pre-formed sections are made from abrasion by the ballast, if desired a membrane is provided between the material of the pre-formed sections and the ballast.

[0019] The support sleepers or blocks may have fixing means to which the rails may be secured e.g. by grouting, bolting, welding or any other appropriate means.

[0020] To enable the positions of such sleepers or

blocks in the sections to be determined during manufacture and retained during transport and handling of the sections, each pre-formed section may include temporary alignment means secured to the sleepers or blocks and relative to the sections to retain the sleepers or blocks in a set position prior to laying of the pre-formed sections on the foundation, which temporary alignment means are adapted to be removed prior to the rails being secured to the sleepers or blocks. For example such means may include lengths of service rail, or timber or plastic strips for example, which may be replaced when the running rails on which the vehicle runs, are laid along the track pavement.

[0021] Although the pre-formed sections may be made from any suitable material, preferably the pre-formed sections are made of reinforced and/or pre-stressed concrete. However the sections may be made of and/or contain other materials.

[0022] The foundation may be made of and/or be a ballast foundation of a conventional track, the rails and sleepers of which have been removed. The foundation on which the track pavement is provided may thus include ballast and there may be provided between the foundation and the concrete pavement, a membrane to protect the underside of the track pavement from abrasion by the ballast of the foundation.

[0023] According to a second aspect of the invention we provide a method of providing a track for railway vehicles on a base according to claim 12.

[0024] A track made by the method may have any of the features of the track according to the first aspect of the invention.

[0025] The invention will now be described with reference to the accompanying drawing which is a perspective view of a pre-formed section of track in accordance with the invention.

[0026] Referring to the drawing there is shown a track 10 for a railway vehicle such as a train, tram or the like which may be used to transport passengers and/or goods.

[0027] The track 10 includes a foundation 11 which could be a foundation laid for the track 10, or an existing foundation of for example, a conventional railway track. The foundation 11 may thus comprise ballast which may be levelled as necessary to receive a track pavement 12 as hereinafter described, so that the track 10 is at a desired level.

[0028] The track pavement 12 comprises a plurality of pre-formed sections 13, which are laid end to end, and preferably are connected together. Thus the pre-formed sections 13 are generally elongate and in this example are of generally channel shape in cross section, having a base 14, and a pair of upstands 15,16.

[0029] At each end of each pre-formed section 13, there are provided connectors 18 (only shown illustratively in the drawing) by means of which the pavement sections 13 may be connected to adjacent pavement sections 13.

[0030] The sections 13 are pre-formed in a settable material such as concrete, reinforced or supported macadam or the like, in the channel shape, and the ends of the channels are closed by temporary closure means, such as the closure boards 20 shown in the drawing. These boards 20 are removed from the sections 13 when the sections 13 are laid on the foundation 11. Their purpose is to retain within the channels of the sections 13, ballast 22.

[0031] In an alternative arrangement, instead of providing boards 20 temporarily to close the channel ends, the ballast may otherwise be prevented from spilling from the section 13 while the section 13 is transported to and laid on the foundation 11, for example by applying a glue to the ballast at least adjacent the channel ends. The ballast 22 may be pre-compacted in any event to facilitate its retention in the sections 13.

[0032] The track pavement 12 further comprises sleepers 25 on the ballast 22 within the channels of the pre-formed sections 13, on which in use, rails on which railway vehicles run, are supported. The sleepers may be made of concrete, steel or other metal, or even timber as desired. Steel or the like is preferred as less ballast will be required. As seen in the drawings, there are provided temporary service rails 26, 27 which extend only substantially over the length of the section 13. These service rails 26, 27 may be temporary secured to the sleepers 25 so as to maintain the sleepers 25 in their factory set positions during transport of the sections 13 to site, and laying of the sections 13 on the foundation 11. The service rails 26, 27 may need to be secured relative to the sections 13 as the sections 13 are transported and laid. Once the pavement 12 is laid, the service rails 26, 27 are removed, and proper running rails (not shown) which may extend for a substantial number of pre-formed sections 13 lengths, may then be laid on the pavement 12, with the running rails being secured to the sleepers 25.

[0033] Any suitable kind of fixings may be provided to fix the running rails to the sleepers 25, such as clips, grouting, welding or the like.

[0034] Instead of providing sleepers 25 in the channels or otherwise of the track pavement 12, blocks may be provided within or on the track pavement 12, to support the running rails. Instead of providing temporary service rails 26, 27 any other means to retain the sleepers 25 or blocks in factory set positions of the pavement 12 may be provided, such as timber or plastic strips. Such temporary means need not be removed if this is not a requirement for laying the running rails.

[0035] Where the pavement sections 13 are made of concrete, the concrete may be reinforced and/or pre-stressed for strength. If desired, parts of the sections 13, or the entire sections 13 may be made from other materials such as macadam, steel or other metals, or a combination of such materials. For one example of an alternative construction, the base 14 of the channel may be made from concrete, and the upstands 15, 16 from

metal, but in each case the section 13 is pre-formed in a factory environment, preferably complete with ballast 22, sleepers 25 or other rail supports.

[0036] To allow for drainage of water from the channels of the sections 13, each section 13 may incorporate a fall in level along the base 14 so that water e.g. as a result of precipitation, may flow along the pavement 12 to drainage openings (not shown) provided in at least some of the sections 13. Such drainage openings may be connected to a drain or simply allow such water to soak/flow away.

[0037] It will be appreciated that as the track 10 is subject to loadings in use as a result of railway traffic passing along the pavement, the concrete may become worn by the ballast of the foundation 11 and/or the ballast 22 within the channels. Accordingly, a protective membrane may be interposed between the pavement 12 and the foundation 11 and/or between the ballast 22 of the pavement 12 and the pre-formed sections 13. The ballast 22 of the pavement 12 will be prevented from settling by the upstands 15, 16 of the sections 13.

[0038] If desired, because the sections 13 are pre-formed, the sections 13 may be formed in a factory environment with additional features. For example the pavement 12 may be provided with a hollow formed by ducts along the sections, in which services such as pipes and/or cable may be laid. Such hollow may be provided within an upstand 15, 16 of the pavement 12, and the hollow may be closed with covers for protection from the weather and tampering. Such covers may span a single or a plurality of the pre-formed sections as desired.

[0039] Additionally and/or alternatively, the pavement 12, e.g. in one or each of the upper surfaces 30, 31 of the upstands 15, 16, there may be provided formations, such as openings, to receive railway equipment, such as bases to support signs, signalling or control equipment such as sensors, adjacent the running rails, and/or baffles or other sound attenuating or absorbing members which being located close to the running rails, will be operative to affect sound produced as railway vehicles pass over the track 10.

[0040] The upstands 15,16 or other parts of the pavement 12 may be adapted e.g. by the provision of lifting hooks or the like, to facilitate the laying of the pre-formed sections by lifting the sections 13 from a delivery vehicle and lowering them into position.

[0041] Provided the foundation 11 is well prepared, a track 10 may rapidly and relatively easily be provided with all the advantages of a track having a pavement, but without the installation difficulties of conventional pavements which are cast or otherwise formed on site.

[0042] By virtue of the pavement being formed by coupled sections 13, adjustment of the track is facilitated because each section 13 can be adjusted individually, uncoupling a section 13 from adjacent section 13, if necessary. Thus for example the level and/or cant of the track may be adjusted. On initial installation, final adjustment of the track level etc. may be achieved by tamping, as is conventional with conventional ballast and sleeper tracks.

[0043] Various other modifications may be made without departing from the scope of the invention as defined in the claims.

Claims

1. A track (10) for railway vehicles including a foundation (11), a track pavement (12) on the foundation (11), and a pair of rails (26, 27) supported by the track pavement (12), **characterised in that** the track pavement (12) includes a plurality of pre-formed sections (13) delivered to site and laid end to end and connected together, the pre-formed sections (13) each including ballast (22), with means (15, 16, 20) being provided to prevent the ballast (22) spilling from the sections (13) prior to the sections (13) being laid, the pre-formed sections further including support sleepers, or blocks, the sleepers or blocks having fixing means to which the rails may be secured.

2. A track (10) according to claim 1 **characterised in that** the sections (13) are generally of channel shape including a base (14) and a pair of upstands (15, 16), the ballast (22) and sleepers (25) or blocks being supported on the base (14) in the channel.

3. A track (10) according to claim 2 **characterised in that** at least one of the upstands (15, 16) includes a hollow to accommodate services.

4. A track (10) according to any one of the preceding claims **characterised in that** the pre-formed sections (13) are adapted to support sound deflecting or sound absorbing or sound attenuating members which reduce sound emanating from the rail interface with the wheels of a railway vehicle.

5. A track (10) according to any one of the preceding claims **characterised in that** the pre-formed sections (13) are formed such that precipitation drains from the sections (13) when laid.

6. A track (10) according to claim 5 **characterised in that** the pre-formed sections (13), or at least some of the pre-formed sections (13) are provided with drainage means which permit water to flow from the pavement (12).

7. A track (10) according to any one of the preceding claims **characterised in that** the pre-formed sections (13) include coupling means (18) to facilitate their coupling to adjacent pre-formed sections (13).

8. A track (10) according to any one of the preceding claims **characterised in that** the means (15, 16, 20) which prevent the ballast (22) spilling from the pre-formed section (13) comprises a temporary closure means (20) which is removed when the section (13) is laid.

9. A track (10) according to claim 8 **characterised in that** each pre-formed section (13) includes temporary alignment means (26, 27) secured to the sleepers (25) or blocks and relative to the sections (13) to retain the sleepers (25) or blocks in a set position prior to laying of the pre-formed section (13) on the foundation (11), which temporary alignment means (26, 27) are adapted to be removed prior to a rail being secured to the sleepers (25) or blocks.

10. A track (10) according to claim 9 **characterised in that** the alignment means (26, 27) includes lengths of service rail secured to the sleepers (25) or blocks and relative to the sections (12).

11. A track according to any one of the preceding claims **characterised in that** the pre-formed sections (13) are made of reinforced and/or pre-stressed concrete and the foundation (11) includes ballast and there is provided between the foundation (11) and the concrete pavement (12) a membrane.

12. A method of providing a track (10) for railway type vehicles on a foundation (11), **characterised in that** the method includes laying end to end a plurality of sections of track pavement (12) on the foundation (11), the sections (13) each being preformed, and each including ballast (22) with means (15, 16, 20) being provided to prevent the ballast (22) spilling from the sections (13) prior to the sections (13) being laid, and support sleepers (25) or blocks supported on the ballast (22), the method including connecting the pre-formed sections (13) together to provide a track pavement (12), and supporting a pair of rails on the support sleepers (25) or blocks of the track pavement (12).

Patentansprüche

1. Schienengleis (10) für Schienenfahrzeuge mit einem Fundament (11), einem Schienenunterbau (12) auf dem Fundament (11) und einem Paar von Schienen (26, 27), die von dem Schienenunterbau getragen werden, **dadurch gekennzeichnet, daß** der Schienenunterbau (12) eine Vielzahl von vorgefertigten Abschnitten (13) aufweist, die an den Bauplatz geliefert, Ende an Ende gelegt und miteinander verbunden werden, wobei die vorgefertigten Abschnitte jeweils Schotter (22) umfassen und Mittel (15, 16, 20), die angeordnet sind, um zu verhindern, daß der Schotter (22) über die Abschnitte (13) hinaus fällt, bevor die Abschnitte (13) verlegt sind, und die vorgefertigten Abschnitte ferner Stützschwellen oder Stützblöcke umfassen, wobei die Schwellen oder Blöcke Befestigungsmittel aufweisen, an denen die Schienen befestigbar sind.

2. Schienengleis (10) nach Anspruch 1, **dadurch gekennzeichnet, daß** die Abschnitte (13) im wesentlichen eine Kanalform aufweisen, umfassend eine Basis (14) und ein Paar von aufrechten Elementen (15, 16), wobei der Schotter (22) und die Schwellen (25) oder Blöcke von der Basis (14) in dem Kanal gehalten sind.

3. Schienengleis (10) nach Anspruch 2, **dadurch gekennzeichnet, daß** mindestens eines der aufrechten Elemente einen Hohlraum aufweist, um Versorgungsmittel aufzunehmen.

4. Schienengleis (10) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** die vorgefertigten Abschnitte (13) ausgelegt sind, um schallablenkende, schallabsorbierende oder schalldämpfende Elemente zu tragen, die den Schall reduzieren, der in der Grenzfläche zwischen der Schiene und den Rädern eines Schienenfahrzeuges erzeugt wird.

5. Schienengleis (10) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** die vorgefertigten Abschnitte (13) so gebildet sind, daß Niederschlag von den Abschnitten (13) abläuft, wenn diese verlegt sind.

6. Schienengleis (10) nach Anspruch 5, **dadurch gekennzeichnet, daß** die vorgefertigten Abschnitte (13) oder mindestens einige der vorgefertigten Abschnitte (13) Drainagemittel aufweisen, die es ermöglichen, daß Wasser aus dem Unterbau (12) abfließt.

7. Schienengleis (10) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** die vorgefertigten Abschnitte (13) Kupplungsmittel (18) aufweisen, um ihre Kupplung an benachbarte vorgefertigte Abschnitte (13) zu ermöglichen.

8. Schienengleis (10) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** die Mittel (15, 16, 20), die ein Hinausfallen des Schotters (22) über die vorgefertigten Abschnitte (13) verhindern, ein vorübergehendes Verschlußmittel (20) aufweisen, das entfernt wird, wenn der Abschnitt (13) verlegt ist.

9. Schienengleis (10) nach Anspruch 8, **dadurch gekennzeichnet, daß** jeder vorgefertigte Abschnitt

(13) vorübergehende Ausrichtmittel (26, 27) aufweist, die an den Schwellen (25) oder Blöcken und relativ zu den Abschnitten (13) befestigt sind, um die Schwellen (25) oder Blöcke in einer bestimmten Lage zu halten, bevor der vorgefertigte Abschnitt (13) auf dem Fundament (11) verlegt wird, wobei die vorübergehenden Ausrichtmittel (26, 27) dafür ausgelegt sind, entfernt zu werden, bevor eine Schiene an den Schwellen (25) oder Blöcken befestigt wird.

10. Schienengleis (10) nach Anspruch 9, **dadurch gekennzeichnet, daß** die Ausrichtmittel (26, 27) Längenabschnitte einer Versorgungsschiene aufweisen, die an den Schwellen (25) oder Blöcken und relativ zu den Abschnitten (12) befestigt sind.

11. Schienengleis (10) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** die vorgefertigten Abschnitte (13) aus verstärktem und / oder vorgespanntem Beton hergestellt sind und das Fundament (11) Schotter umfaßt, wobei zwischen dem Fundament (11) und dem Betonunterbau (12) eine Membran angeordnet ist.

12. Verfahren zum Bereitstellen eines Schienengleises (10) für Schienenfahrzeuge auf einem Fundament (11), **dadurch gekennzeichnet, daß** das Verfahren umfaßt : Verlegen, Ende an Ende, einer Vielzahl von Abschnitten eines Schienenunterbaus (12) auf dem Fundament (11), wobei die Abschnitte (13) jeweils vorgefertigt sind und jeweils Schotter (22) umfassen, mit Mitteln (15, 16, 20), die angeordnet sind, um zu verhindern, daß Schotter (22) über die Abschnitte (13) hinaus fällt, bevor die Abschnitte (13) verlegt sind, und Stützschwellen (25) oder Blöcke, die von dem Schotter (22) getragen werden, wobei das Verfahren umfaßt: Miteinander verbinden der vorgefertigten Abschnitte (13), um einen Schienenunterbau (12) bereit zu stellen, und Abstützen eines Paares von Schienen auf den Stützschwellen (25) oder Blöcken des Schienenunterbaus (12).

Revendications

1. Voie ferrée (10) pour véhicules de chemin de fer, incluant une fondation (11), une chaussée de voie ferrée (12) située sur la fondation (11), et deux rails (26, 27) supportés par la chaussée de voie ferrée (12), **caractérisée en ce que** la chaussée de voie ferrée (12) comprend une pluralité de sections préformées (13) délivrées à un site, placées bout à bout et reliées ensemble, les sections préformées (13) incluant chacune un ballast (22) et des moyens (15, 16, 20) prévus pour empêcher le ballast (22) de se déverser des sections (13) avant que les sections (13) ne soient placées, les sections préformées incluant en outre des traverses de support ou blocs, les traverses ou blocs comportant des moyens de fixation auxquels les rails peuvent être fixés.

2. Voie ferrée (10) selon la revendication 1, **caractérisée en ce que** les sections (13) ont généralement une forme de canal incluant une base (14) et deux rebords (15, 16), le ballast (22) et les traverses (25) ou blocs étant supportés par la base (14) du canal.

3. Voie ferrée (10) selon la revendication 2, **caractérisée en ce qu'**au moins l'un des rebords (15, 16) inclut une cavité servant à recevoir des services.

4. Voie ferrée (10) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** les sections préformées (13) sont aptes à supporter des éléments de renvoi de son, d'absorption de son ou d'atténuation de son, qui réduisent un son émanant de l'interface entre le rail et les roues d'un véhicule de chemin de fer.

5. Voie ferrée (10) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** les sections préformées (13) sont formées de sorte que les précipitations s'écoulent des sections (13), lorsqu'elles sont placées.

6. Voie ferrée (10) selon la revendication 5, **caractérisée en ce que** les sections préformées (13) ou au moins certaines des sections préformées (13) sont pourvues de moyens de drainage qui permettent à l'eau de s'écouler de la chaussée (12).

7. Voie ferrée (10) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** les sections préformées (13) incluent des moyens de couplage (18) servant à faciliter leur couplage avec des sections préformées (13) adjacentes.

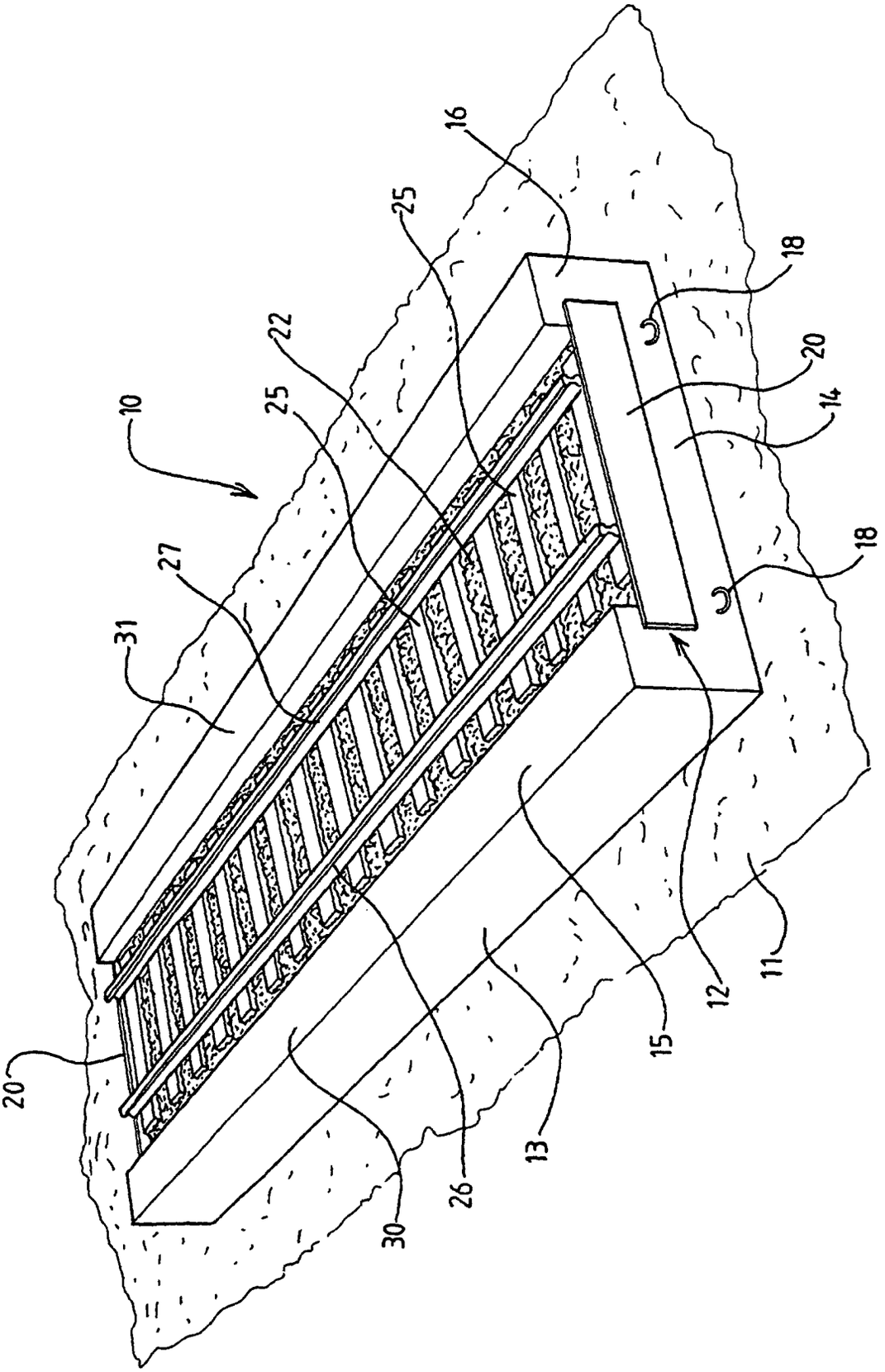
8. Voie ferrée (10) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** les moyens (15, 16, 20) qui empêchent le ballast (22) de se déverser de la section préformée (13) comprennent des moyens de fermeture temporaire (20) que l'on retire lorsque la section (13) est placée.

9. Voie ferrée (10) selon la revendication 8, **caractérisée en ce que** chaque section préformée (13) inclut des moyens d'alignement temporaires (26, 27) par rapport aux sections (13), fixés aux traverses (25) ou blocs pour maintenir les traverses (25) ou blocs dans une position fixe avant de placer les sections préformées (13) sur la fondation (11), lesquels moyens d'alignement temporaires (26, 27) sont aptes à être retirés avant qu'un rail soit fixé aux traverses (25) ou blocs.

10. Voie ferrée (10) selon la revendication 9, **caractérisée en ce que** les moyens d'alignement (26, 27) par rapport aux sections (13), incluent des longueurs de rails de circulation fixés aux traverses (25) ou blocs.

11. Voie ferrée selon l'une quelconque des revendications précédentes, **caractérisée en ce que** les sections préformées (13) sont fabriquées à partir de béton renforcé et/ou précontraint, la fondation (11) comprenant un ballast et une membrane placée entre la fondation (11) et la chaussée en béton (12).

12. Procédé de réalisation d'une voie ferrée (10) sur une fondation (11), pour véhicules de chemin de fer, **caractérisé en ce que** le procédé inclut une pluralité de sections de chaussée de voie ferrée (12) placés bout à bout sur la fondation (11), les sections (13) étant chacune préformée et incluant chacune un ballast (22) et des moyens (15, 16, 20) prévus pour empêcher le ballast (22) de se déverser des sections (13) avant que les sections (13) ne soient placées, et des traverses de support (25) ou blocs supportées par le ballast (22), le procédé incluant la liaison des sections préformées (13) ensembles, dans le but de fournir une chaussée de voie ferrée (12), et le montage de deux rails sur les traverses de support (25) ou blocs de la chaussée de voie ferrée (12).


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