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**(54) TRACK SUPERSTRUCTURE, IN PARTICULAR FOR TRAMWAY, TRAM-RAILWAY AND UNDERGROUND RAILWAY LINES**

GLEISOBERBAU, INSBESONDERE FÜR STRASSENBAHNEN, STRASSEN-EISENBAHNEN UND  
UNTERGRUNDBAHNLINIEN

SUPERSTRUCTURE DE VOIES, EN PARTICULIER, POUR DES VOIES FERREES DE  
TRAMWAYS, DE CHEMINS DE FER ET DE METROS

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## Description

**[0001]** This invention relates to a track superstructure, in particular for tramway, tram-railway and underground railway lines.

**[0002]** Track superstructures are well known. A first known type of superstructure uses a plurality of sleepers supported by a bed of ballast and to which the rails are fixed. To the sides of and between said rails there is then cast a covering to the level of the upper surface of the rails.

**[0003]** This known type of superstructure has however the drawback of being laborious in terms of the operations involved in refilling with ballast and packing it around the sleepers, this requiring breakage of the road surface with consequent interruption of the line.

**[0004]** Another known type of superstructure consists of a foundation cast on a seat and on which there rest a plurality of reinforced concrete platforms spaced from said foundation by an anti-vibration blanket. The rails are fixed on said platforms and a filling layer is applied to level the rail surface with the roadway.

**[0005]** This type of superstructure also has certain drawbacks, and in particular:

- the need to rigorously check the planarity of the foundation to ensure a uniform platform level,
- time loss in replacing or levelling platforms,
- the need to provide adequately equipped road sites which interrupt the tram service.

FR-A-2.691.484 relates to the laying of rails in a level adjustable trench into which concrete is subsequently cast in order to fasten the rails.

**[0006]** An object of the invention is to eliminate the drawbacks jointly or separately present in known types of superstructure by providing a superstructure which is reliable and of lesser cost than such known types.

**[0007]** A further object of the invention is to provide a superstructure which can be maintained at low cost without requiring the line to be interrupted for long periods.

**[0008]** A further object of the invention is to provide a superstructure which enables maintenance to be effected in a simple and comfortable manner.

**[0009]** These and further objects which will be apparent from the ensuing description are attained according to the invention through a track superstructure, in particular for tramway, tram-railway and underground railway lines as described in claim 1.

**[0010]** A preferred embodiment of the invention is described hereinafter with reference to the accompanying drawings, on which:

Figure 1 shows a cross-section through the metal structure of the superstructure, mounted in the trench,

Figure 2 shows an enlarged cross-section through

a prefabricated platform,

Figure 3 shows a longitudinal section through the platforms while under adjustment after being mounted on the metal structure,

Figure 4 shows a longitudinal section through the superstructure after the concrete has been cast,

Figure 5 shows the superstructure in plan view,

Figure 6 is an enlarged detailed view of the sleeper adjustment screw,

Figure 7 shows the platform removal,

Figure 8 shows the platform removal for renovating the concrete casting.

**[0011]** As can be seen from the figures, the superstructure according to the invention is mounted within a continuous trench 2 formed in the roadway 4, and comprises substantially a modular load-bearing structure 6 consisting of four channel-shaped longitudinal members 8 to which there are welded a plurality of cross-members 10 formed by channel beams coupled together by welding them to an internally threaded bush 12 within there engages a corresponding screw 14 acting as a bearing foot for the cross-members.

**[0012]** Specifically, each cross-member is supported by four screws which in pairs form two channels bounding each rail of the track, each screw being housed in a sleeve 18. The superstructure also comprises a plurality of prefabricated modular reinforced concrete platforms 20 of substantially inverted isosceles trapezium cross-section which are covered on their sides and lower surface with a first layer of elastic material 22 for damping purposes, and an outer layer of glass-reinforced plastic 24.

**[0013]** A rail portion 26 of the railway, tramway or tram-railway line is housed in a suitable channel 16 preferably of stainless steel, which is embedded in the platform and is fixed thereto by a plurality of bolts 28 engaged in a threaded bush 32 by way of a previously interposed coil spring 30.

**[0014]** The superstructure of the invention is assembled in the following manner:

**[0015]** A reinforced concrete bed 34 is cast on the bottom of the trench, after which a plurality of prefabricated concrete panels 36 are positioned along the sides of the trench. The trench is covered with a layer of insulating material 38, after which the structures 6 are placed in position and the cross-members 10 adjusted in height by operating the adjustment screws 14. The prefabricated platforms 20 are then rested on said cross-members, the gauge between the two rails then being adjusted by means of suitable spacers 40. Said spacers 40 consist of a cylindrical sleeve provided with threaded endpieces which engage corresponding rods 42 secured to the platforms 20.

**[0016]** Rotation in one direction or the other causes the two platforms and hence the two rails to approach or withdraw from each other. A final level adjustment of the platforms 20 is then made by operating the screws

14.

[0017] Having made the adjustment, concrete is then cast, interrupted at predetermined distances by transverse sheets of insulating material (not shown on the drawings), so as to cover the trench as far as the level of the upper surface of the panels (see Figure 4).

[0018] The screws 14 are then removed from the containing sleeves 18 and a plurality of prefabricated reinforced concrete panels 46 are then laid to level the roadway.

[0019] If the rail needs to be replaced because of wear, it is sufficient to disengage the bolts 30 and extract the various damaged rail pieces from their housing-channel.

[0020] If the insulating blanket 22 needs to be replaced due to infiltration or wear with time, the platforms 20 are raised and their base blanket is then replaced (see Figure 7).

[0021] If work is required on the concrete casting 44, the panels 46 and platforms 20 are firstly removed, after which the screws 14 are inserted into the sleeves 18 to engage the bushes 12 rigid with the cross-members 10 in order to be able to rotate the screws and return the casting 44 to the correct level together with the structure 6 incorporated in it (see Figure 8). A contribution to the renewal work is also obtained by injecting concrete through suitable tubes previously installed during assembly.

[0022] From the foregoing it is apparent that the superstructure of the invention presents many advantages, and in particular:

- it enables the line parts to be rapidly replaced by merely removing the platform from the region concerned, this being an operation which can be carried out during the night when the traffic level is reduced,
- it considerably reduces vibro-acoustic pollution because of the presence of the insulating blankets,
- it enables the rails to be easily and comfortably levelled and aligned.

## Claims

1. A track superstructure, in particular for tramway, tram-railway and underground railway lines, comprising within a continuous trench in the roadway a level-adjustable modular metal structure (6), and means (12,14) for adjusting the level of said structure, **characterised by** further comprising:
  - a plurality of prefabricated modular platforms (20) each housing a channel (16) in which a rail piece (26) is removably inserted, said platforms being adjacent to each other in longitudinal direction and at least partly covered with

an anti-vibration blanket (22) and resting on said structure,

- a concrete casting (44) filling the interior of the trench to incorporate the metal structure and the lower and lateral surface of said platforms, substantially to the level of the roadway surface so that these platforms may be removed from the modular metal structure (6).

2. A superstructure as claimed in claim 1, **characterised in that** the structure (6) consists of C-shaped longitudinal members (8) and cross-members (6).

3. A superstructure as claimed in claim 1, **characterised in that** the adjustment means consist of threaded screws (14) engaging in corresponding bushes (12) rigid with the structure, the ends of said screws acting as support elements during the installation of the superstructure..

4. A superstructure as claimed in claim 3, **characterised in that** said screws (14) are housed in corresponding sleeves (18).

5. A superstructure as claimed in claim 1, **characterised in that** each platform (20) is substantially of inverted isosceles trapezium cross-section.

6. A superstructure as claimed in claim 1, **characterised in that** each platform is constructed of reinforced concrete.

7. A superstructure as claimed in claim 1, **characterised in that** each rail (26) is fixed in the channel by bolts (28) which engage in corresponding threaded bushes (32) by way of a previously interposed coil spring (32).

8. A superstructure as claimed in claim 1, **characterised in that** each platform (20) is covered externally with a layer of glass-reinforced plastic.

9. A superstructure as claimed in claim 1, **characterised by** comprising a plurality of panels (36) interposed between the platforms and positioned laterally to them for their levelling with the roadway.

## Patentansprüche

1. Gleisoberbau, insbesondere für Straßenbahnen, Straßen-Eisenbahnen und Untergrundbahnen, welcher in einem durchgehenden Graben in der Fahrbahn eine höhen-einstellbare modulare Metallstruktur (6) und Mittel (12, 14) zur Höheneinstellung der besagten Struktur umfasst, **dadurch gekennzeichnet, dass** er weiter umfasst:

- eine Vielzahl von vorgefertigten modularen Plattformen (20), die jeweils einen Kanal (16) enthalten, in den ein Schienenstück (26) entfernt einsetzbar ist, wobei die Plattformen in Längsrichtung nebeneinander angeordnet und mit wenigstens einer Antivibrationsabdeckung (22) bedeckt sind und auf der besagten Struktur gelagert sind, 5
  - ein Betongussteil (44), das das Innere des Grabens füllt, um die Metallstruktur und die untere und die seitliche Oberfläche der besagten Plattformen im wesentlichen bis zur Fahrbahnhöhe aufzunehmen, so dass diese Plattformen von der modularen Metallstruktur (6) entfernt werden können. 10 15
2. Gleisoberbau nach Anspruch 1, **dadurch gekennzeichnet, dass** die Struktur (6) aus C-förmigen Längselementen (8) und Querelementen (10) besteht. 20
  3. Gleisoberbau nach Anspruch 1, **dadurch gekennzeichnet, dass** die Einstellungsmittel aus Gewindeschrauben (14) bestehen, welche in entsprechende Hülsen (12) eingreifen, die starr mit der Struktur verbunden sind, wobei die Enden der besagten Schrauben als Lagerelemente während der Errichtung des Gleisoberbaus wirken. 25
  4. Gleisoberbau nach Anspruch 3, **dadurch gekennzeichnet, dass** die Schrauben (14) in entsprechenden Hülsen (18) aufgenommen sind. 30
  5. Gleisoberbau nach Anspruch 1, **dadurch gekennzeichnet, dass** jede Plattform (20) im Querschnitt ein im wesentlichen umgedrehtes gleichschenkeliges Trapez bildet. 35
  6. Gleisoberbau nach Anspruch 1, **dadurch gekennzeichnet, dass** jede Plattform aus armiertem Beton besteht. 40
  7. Gleisoberbau nach Anspruch 1, **dadurch gekennzeichnet, dass** jede Schiene (26) in dem Kanal mit Bolzen (28) befestigt ist, welche in entsprechende Gewindehülsen (32) mittels vorher dazwischen geschalteter Spiralfeder (32) eingreifen. 45
  8. Gleisoberbau nach Anspruch 1, **dadurch gekennzeichnet, dass** jede Plattform (20) außen mit einer Schicht aus glasverstärktem Kunststoff bedeckt ist. 50
  9. Gleisoberbau nach Anspruch 1, **dadurch gekennzeichnet, dass** er eine Vielzahl von Paneelen (36) umfasst, die zwischen den Plattformen und seitlich von ihnen zu ihrer Höheneinstellung mit der Fahrbahn angeordnet sind. 55

## Revendications

1. Une superstructure de voie ferrée, en particulier pour lignes de tramway, et lignes de chemin de fer pour véhicules sous terrain, comprenant à l'intérieur d'une tranchée continue réalisée dans le chemin une structure modulaire en métal (6) dont le niveau est ajustable, et des moyens (12, 14) pour ajuster le niveau de ladite structure, **caractérisée en ce qu'elle** comprend en outre :
  - une pluralité de plateformes (20) modulaires et préfabriquées logeant chacune un canal (16) dans lequel un élément de rails (26) est inséré d'une manière amovible, lesdites plateformes étant adjacentes l'une à l'autre dans la direction longitudinale et étant au moins partiellement recouvertes d'une couverture anti-vibration (22) qui repose sur ladite structure,
  - du béton moulé (44) remplissant l'intérieur de la tranchée pour enrober la structure métallique et les surfaces inférieures et latérales desdites plateformes, sensiblement jusqu'au niveau de la surface de la voie ferrée de façon que lesdites plateformes puissent être enlevées de la structure métallique modulaire (6).
2. Une superstructure telle que revendiquée dans la revendication 1, **caractérisée en ce que** la structure (6) consiste en des éléments longitudinaux (8) en forme de C et des traverses (6).
3. Une superstructure telle que revendiquée dans la revendication 1, **caractérisée en ce que** les moyens d'ajustement consistent en des vis filetées (14) engagées dans des manchons correspondants (12) solidaires de la structure, les extrémités desdites vis agissant en tant qu'éléments de support lors de l'installation de la superstructure.
4. Une superstructure telle que revendiquée dans la revendication 3, **caractérisée en ce que** lesdites vis (14) sont logées dans des fourreaux correspondants (18).
5. Une superstructure telle que revendiquée dans la revendication 1, **caractérisée en ce que** chaque plateforme (20) a une section transversale sensiblement en forme de trapèze isocèle inversé.
6. Une superstructure telle que revendiquée dans la revendication 1, **caractérisée en ce que** chaque plateforme est réalisée en béton armé.
7. Une superstructure telle que revendiquée dans la revendication 1, **caractérisée en ce que** chaque rail (26) est fixé dans le canal au moyen de boulons (28) qui sont engagés dans des manchons filetés (32)

au moyen d'un ressort élicoidal (32) préalablement interposé.

8. Une superstructure telle que revendiquée dans la revendication 1, **caractérisée en ce que** chaque plateforme (20) est recouverte extérieurement d'une couche de matière plastique renforcée de fibres de verre. 5
9. Une superstructure telle que revendiquée dans la revendication 1, **caractérisée en ce qu'elle** comprend une pluralité de panneaux (36) interposés entre les plateformes et disposés latéralement par rapport à ces dernières pour les mettre au niveau de la voie ferrée. 10 15

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