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(54) Method of railway track renewal

(57) Method of railway track renewal in an underground tube by replacing a long part of the track by a temporary auxiliary track or bridging construction (2) such that said auxiliary track becomes part of the course of the original track and the train traffic can remain its normal route. The bridge (2) comprises two parallel rigid longitudinal beams (3) between temporary rails (5) and in length adjustable cross beams (4), such that the mutual spacing between beams (3) and rails (5) can be adjusted. The bridge also has the (negative) conductor rail (6) and longitudinal beams (7) parallel to beams (3) and supports (8), having an adjustible length. Bridge(2) behaves like a unitary object.

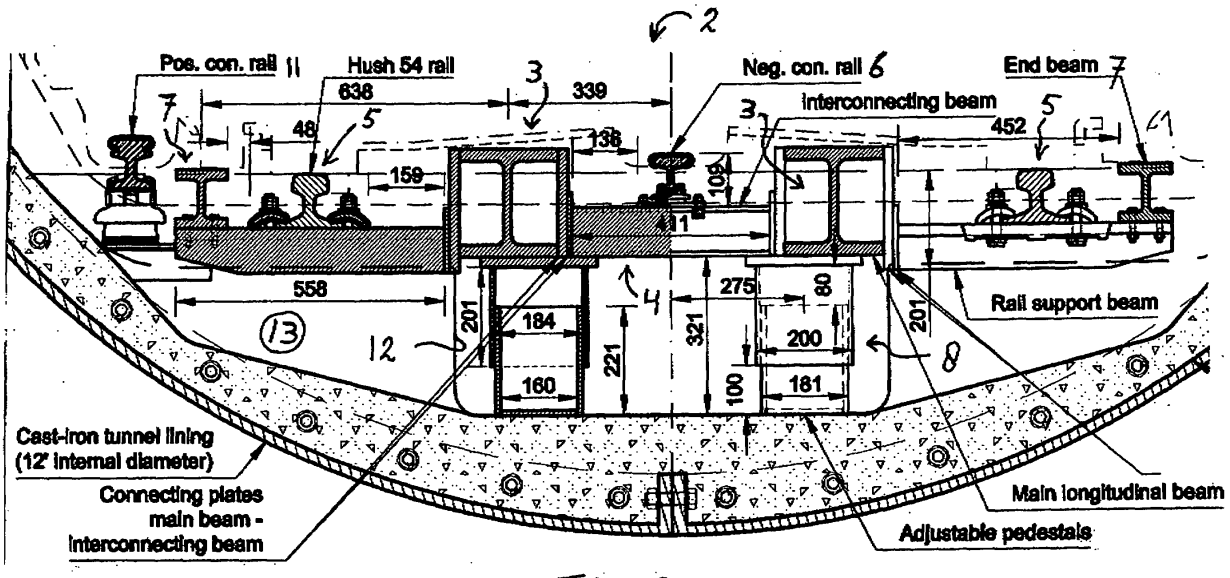

Fig. 2

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Description

[0001] This invention is concerned with maintenance to a railway track, particularly within the narrow space of a buried tube of a subway, especially if the tube dimensions are adapted to contain merely a single track. Although the invention is illustrated by way of replacing the railway track within the buried tube of a subway, it will be appreciated that the field of application is broader and is generally applicable to a railway and its maintenance.

[0002] Commonly, a tube containing a single track offers little or no space aside the track, since the cross sectional tube dimensions are adapted to tightly enclose the track, its foundation, the train moving along the track and the energy and auxiliary supplies. In that case, if replacement of parts of the track is required, e.g. the rails and sleepers, the supply, installation and discharge of the relatively large and heavy parts is difficult and time consuming since all material, equipment and personnel is forced to use the same tube. In practise, when train traffic may be disabled for only a short period, e.g. three hours during the night, the daily progress of replacement of the track is very limited to e.g. one or two meters.

[0003] The object of the invention is to improve the processing of a railway track renewal by proposing to replace a longitudinal part of the track by a temporary auxiliary track which is preferably designed such that it contains means to adapt or adjust the auxiliary track to the local conditions, e.g. one or more of rail width, (horizontal) curvature, level, cant, alignment, such that said auxiliary track becomes part of the course of the original track and the train traffic can maintain its normal route and speed.

[0004] The invention is further eloborated by way of a non-limiting embodiment, refering to the enclosed drawing.

[0005] Fig. 1 shows partly a cross section of a subway tube to which the invention can be applied. Typically, it contains spaced apart, parallel, train wheel bearing rails of the track that are mounted by rail mountings on wooden sleepers, embedded in concrete having a central recess containing gravel. Conductor rails on insulators, between and aside the train rails provide electrical driving power supply to the train. The train rails can be of the so called bullhead type, i.e. they are syzametricaily shaped such they can also be used in inverted position after the original rail head is worn out. It will however be appreciated that the invention is also applicable to different rail types and rail connections and also to different sleeper and power supply types.

[0006] To replace the train rails by another, more common rail type, e.g. vignola or flat bottom type, the original train rails, rail mountings, sleepers and conductor rails have to be removed. These parts are replaced by concrete sleepers and different conductor rails, rail mountings and rails.

[0007] In accordance with the invention, a temporary bridge part or adjustible construction 2 is provided, as illustrated in cross section in fig. 1 and 2, in sectional side view according to line A-A and B-B in fig. 3 resp. 4 and in sectional top view according to line C-C in fig. 5. In the drawings, the construction 2 is shown during the operation of track replacement. Fig. 3, 4 and 5 show only a longitudinal part of the construction 2 at the location where it connects to the original (to be replaced) track. The original track is at the left hand side of line Z (fig. 3-5). Obviously, the construction 2 at its opposite end connects to the original track or new track.

[0008] Construction 2 is provided by two parallel rigid longitudinal beams 3 at both sides of the centre line A-A of the track, between temporary rails 5 of low height. The beams 3 and rails 5 are mutually connected by a plurality of cross beams 4 spaced along their length. These cross beams 4 have an adjustable length, such that the mutual spacing between beams 3 and rails 5 can be adjusted. This is important not only for adjustment to the ends of the original track to which this construction 2 is connected, but also to bend the rails 5 according to the (horizontal) curvature (e.g. a radius of 60 m) of the original track it temporarily replaces. Obviously, the bending stiffness of the beams 3 is sufficiently high such that they form the proper solid "backbone" to horizontally and vertically bend the rails 5. For tight curves the construction 2 offers space to apply a check rail at the inner rail 5.

[0009] Obviously, the cross beams 4 provide some kind of sleepers, adjustable in length. In stead of this, the fastening of the rails 5 and the conductor rail 6 to the relevant cross beam 4 can as an alternative be adjustable or repositionable, such that the cross beams 4 can have a fixed length. E.g. the rail 5 can be clamped to the beam 4 such that it can be shifted along beam 4 after loosening the clamps.

[0010] The central cross beam 4 bears the (negative) conductor rail 6 which also belongs to construction 2.

[0011] To further strengthen construction 2, further longitudinal beams 7 parallel to beams 3 can be provided, e.g. at the outer ends of outer beams 4 as shown.

[0012] Construction 2 is provided with a plurality of longitudinally spaced supports 8, preferably having an adjustible length, e.g. as telescopic rods or tubes. As shown, two arrays of these supports 8 are provided at both sides of the track centre line, also allowing for adjustment of the cant or vertical alignment. Preferably, these supports 8 are designed to completely support the construction 2 and a train bearing on the rails 5. The construction 2 behaves like a unitary object.

[0013] Construction 2 can be provided with running wheels (not shown) or skates or equivalent means such that it can conveniently be moved over the substrate in longitudinal direction, e.g. after being jacked up. Or it can be provided with equipment with lifting points, such that construction 2 can be hoisted to the tunnel roof. It can also be provided with integrated walkway boards to provide an (emergency) walkway.

[0014] Preferably the spacing between the cross beams is such that the old or new sleepers can be nested between these cross beams 4.

[0015] The dimensions of the rail 5 and beam 4 are such that the top of rail 5 is level with the top of the corresponding rail 1 of the original track and the new track.

[0016] With the construction 2 track replacement can be carried out as follows:

[0017] At day 1 the original rails 1, central (negative) conductor rail 10 and sleepers 9 are removed over a predetermined length, preferably substantially equal to the length of the construction 2. Preferably, said length corresponds to a plurality of a length part that can be replaced during a single daily shift when applying the prior art method. Conveniently, said length corresponds to a standard rail length, which is at least 10 m. The original lateral (positive) conductor rail 11 remains in place. The construction 2 is installed and its rails 5 are connected to the ends of the existing rails 1 and its central conductor rail 6 is connected to the ends of the existing central conductor rail 10 and the required alignements of the components of the construction 2 are carried out to allow safe railway traffic. Thus, construction 2 bridges the gap in the original track due to removal of the original rails 1, central (negative) conductor rail 10 and sleepers 9 over said predetermined length. Supports 8 are located in a previously with gravel filled recess 12 in the concrete rail embedment 13.

[0018] At day 2 first the construcion 2 is removed (e.g. rolled forward or backward over at least a distance corresponding to its length) and then the concrete embedment 13 is removed and finally the construction 2 is replaced to allow safe railway traffic.

[0019] At day 3 first the construction 2 is removed, then new sleepers and new rails are installed and aligned, whereafter the sleepers are anchored and then the new rails are removed and finally the construction 2 is replaced to allow safe railway traffic.

[0020] At day 4 first the construction 2 is removed, then the new embedment is installed and finally the construction 2 is replaced to allow safe railway traffic.

[0021] At day 5 first the construction 2 is removed, and then the new rails and the new central conductor rail are installed such that the track replacement for this length part is completed and safe railway traffic in this length part is permanently provided. Then the construction 2 will be used to process a subsequent length of the track, wherein the steps according to day 1 - 5 can be subsequently repeated.

[0022] The invention also covers embodiments obtained by removing one or more features of the above disclosed embodiment, or replacing it by a functional equivalent.

Claims

1. Method of railway track renewal in an underground tube by replacing a long part of the track by a temporary auxiliary track or bridging construction (2) such that said auxiliary track becomes part of the course of the original track and the train traffic can remain its normal route.

2. Method according to claim 1, wherein the bridge (2) has means to adjust or adapt it to the local conditions, e.g. any of rail width, (horizontal) curvature, level, cant, alignment.

3. Method according to claim 1 or 2, carried out in a tube with just enough space for a single track for civil train traffic.

4. Method according to claim 1, 2 or 3, wherein the original rails (1), its mountings, (wooden) sleepers (9) and conductor rail (10) are renewed.

5. Method according to claim 1, 2, 3 or 4, wherein the bridge (2) comprises one or two parallel rigid longitudinal beams (3) at both sides of the centre line A-A of the track, between temporary rails (5), which beams (3) and rails (5) are mutually connected by a plurality of cross beams (4) spaced along their length and adjustable in length, such that the mutual spacing between beams (3) and rails (5) can be adjusted.

6. Method according to any of claims 1-5, the (negative) conductor rail (6) also belongs to bridge (2).

7. Method according to any of claims 1-6, further longitudinal beams (7) parallel to beams (3), e.g. at the outer ends of beams (4) also belong to bridge (2).

8. Method according to any of claims 1-7, longitudinally spaced supports (8), preferably having an adjustible length, e.g. as telescopic rods or tubes, also belong to bridge (2).

9. Method according to any of claims 1-8, wherein the bridge (2) behaves like a unitary object.

10. Method according to any of claims 1-9, wherein the construction (2) is removed at a later time by moving it in longitudinal direction or lifting it and after that is replaced, while in between renewal work is carried out.

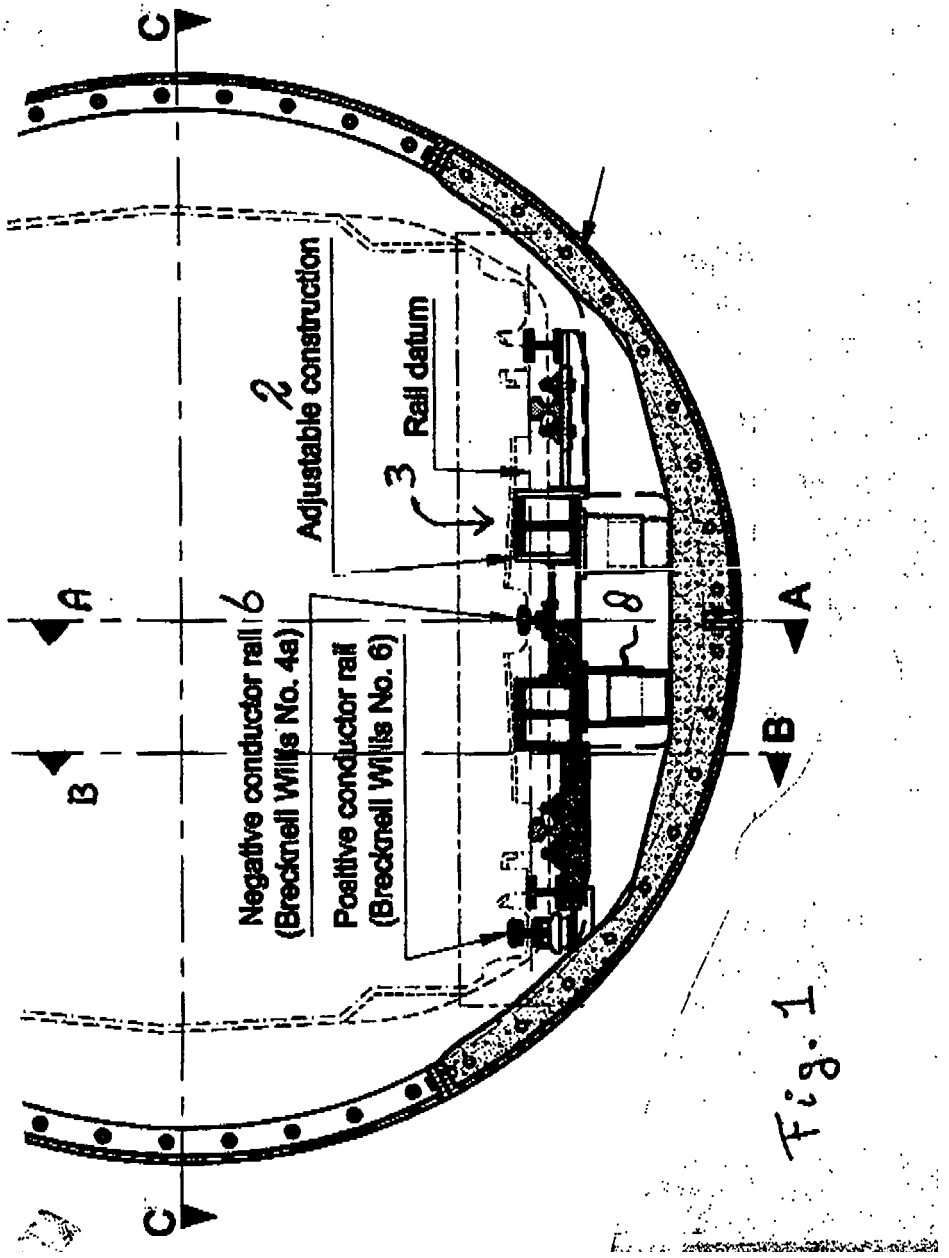
C
C
A
A
B
B
2
Adjustable construction
3
Rail datum
6
Negative conductor rail
(Brecknell Willis No. 4a)
Positive conductor rail
(Brecknell Willis No. 6)
8

Fig. 1

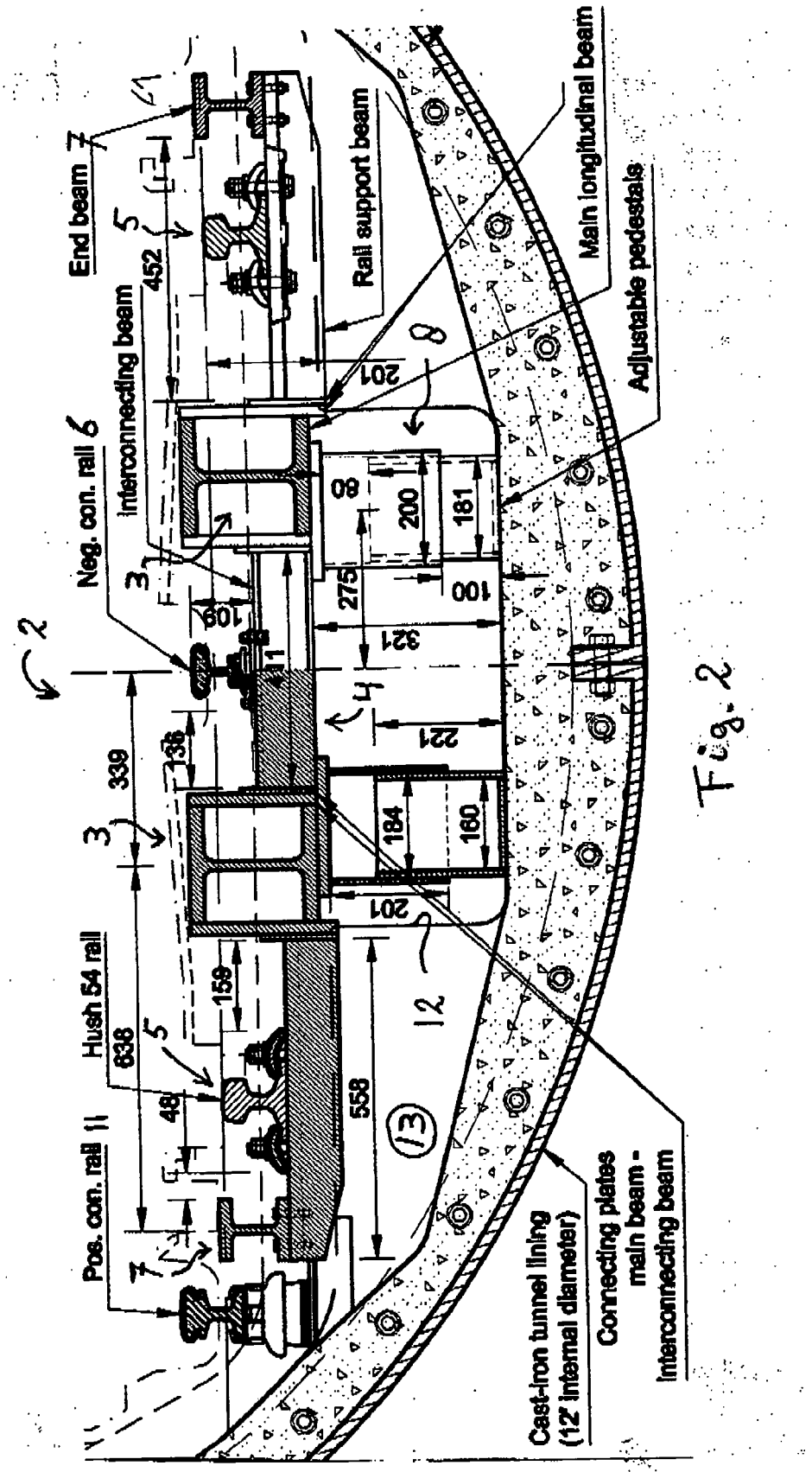
End beam 7
Rail support beam
Main longitudinal beam
Adjustable pedestals
Neg. con. rail 6
Interconnecting beam
Hush 54 rail
Pos. con. rail 11
Cast-iron tunnel lining
(12' internal diameter)
Connecting plates
main beam -
interconnecting beam
452
201
88
200
181
275
100
109
32
24
339
336
184
160
159
638
48
558
13

Fig. 2

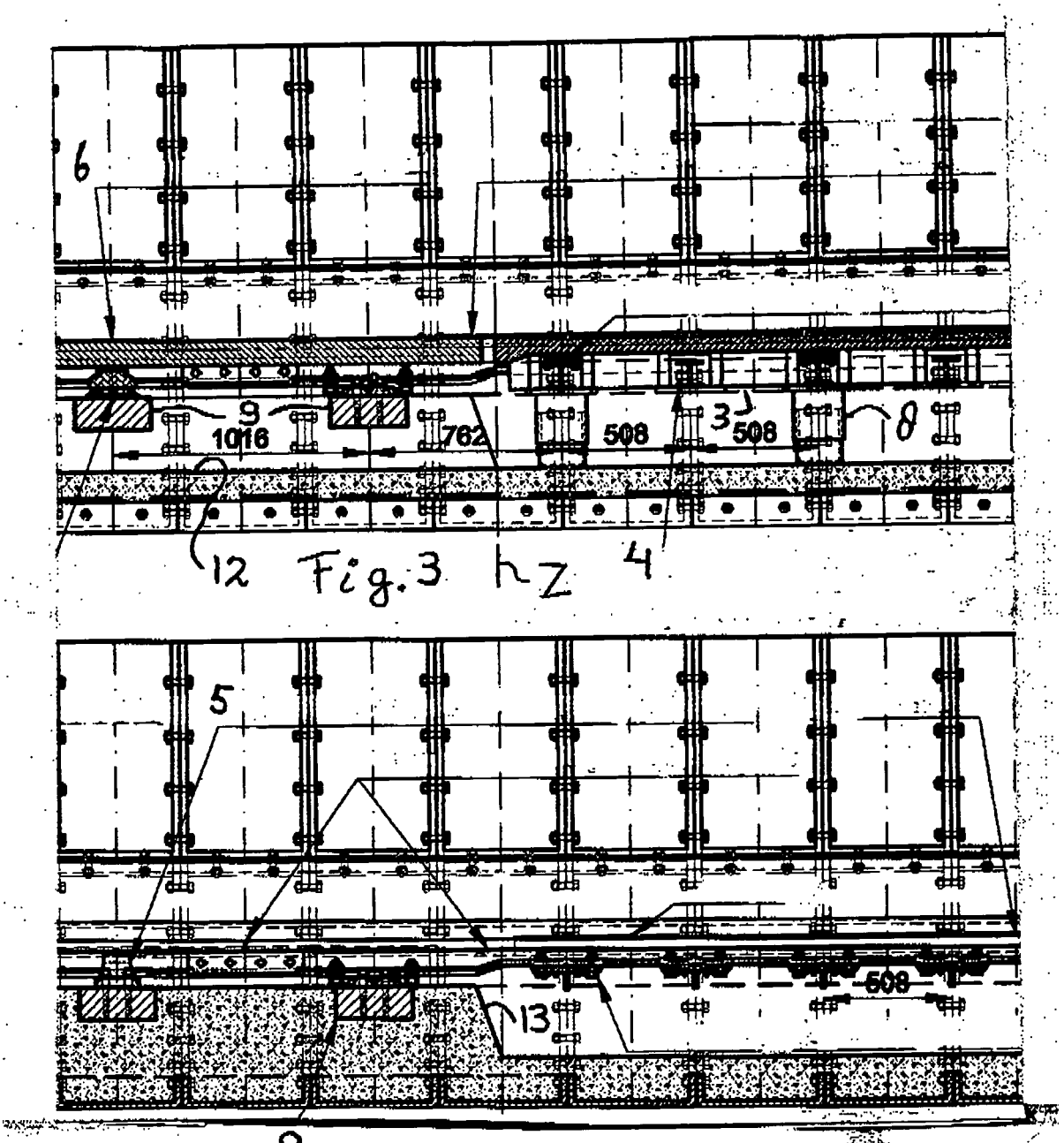

Fig.3

Fig.4

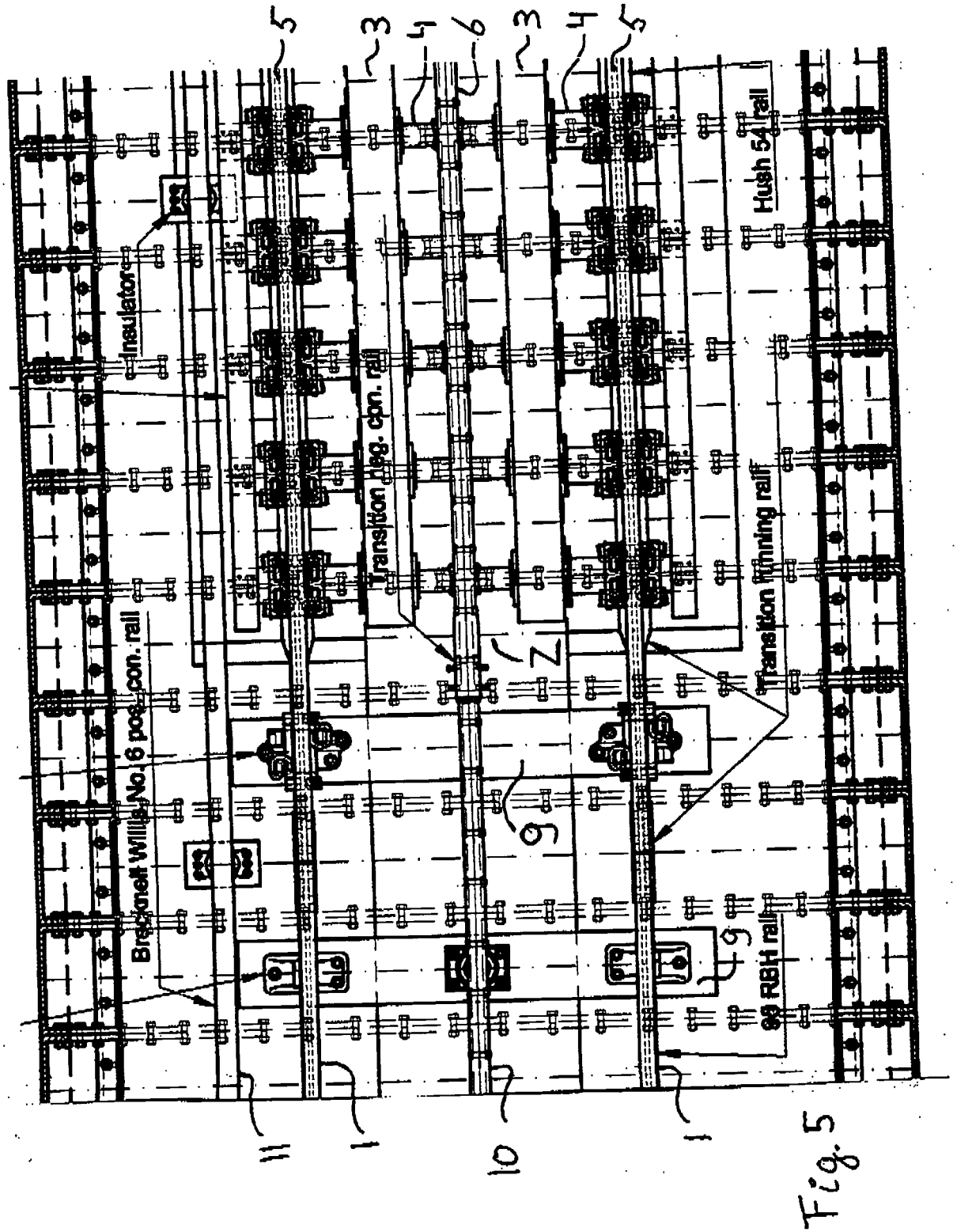
Insulator
Bracknell Wille No. 6 pos. con. rail
Transition tog. con. rail
Hush 54 rail
Transition fitting rail
99 RBH rail
5
3
4
6
3
4
5
9
7
9
11
1
10
1

Fig. 5

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PARTIAL EUROPEAN SEARCH REPORT

which under Rule 45 of the European Patent Convention shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number EP 06 07 5143

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 666 599 A (SUD OUEST TRAVAUX) 13 March 1992 (1992-03-13) * page 1, lines 4-10; claim 3; figures 1-13 *	1,4	INV. E01B2/00 E01B23/00
A		10	

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A		5,7	

X	DE 101 48 727 A1 (FERD. BRASELMANN GMBH & CO. KG) 10 April 2003 (2003-04-10)	1,10	
A	* column 2, lines 10-20; claim 1; figures 1-3 *	3	

A	EP 1 396 578 A (VOLKER STEVIN RAIL & TRAFFIC BV) 10 March 2004 (2004-03-10) * abstract; claim 1; figures 1-4 *	1,4,10	

TECHNICAL FIELDS SEARCHED (IPC)

E01B

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search	Date of completion of the search	Examiner
Munich	31 March 2006	Fernandez, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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INCOMPLETE SEARCH SHEET C

Application Number
EP 06 07 5143

Claim(s) searched completely:
1,3,4,5,7,8,10

Claim(s) not searched:
2,6,9

Reason for the limitation of the search:

Claim 2 and 9 do not include any technical features.

The subject-matter of claim 6 is not clearly defined.

The search was based on the subject-matter that, as far as can be understood, could reasonably be expected to be claimed later in the procedure.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 07 5143

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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31-03-2006

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82