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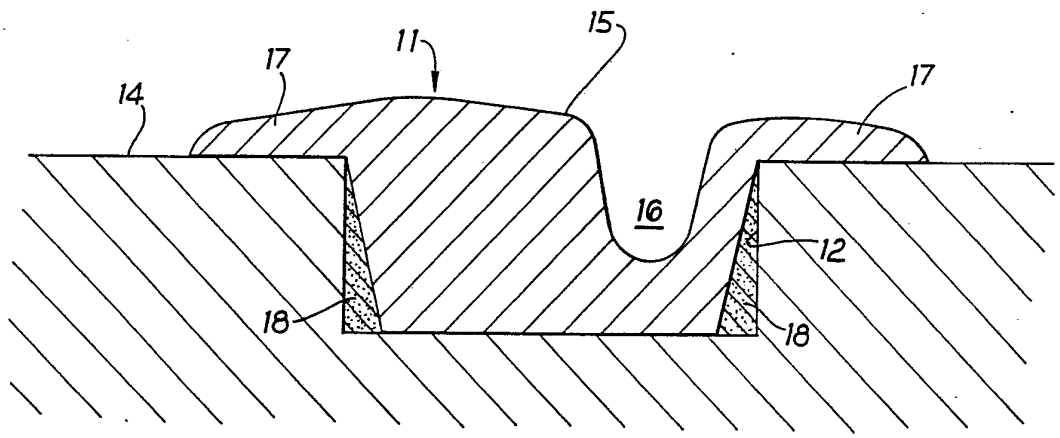
(54) Title: RAIL



(57) Abstract

A rail for vehicles to travel on is supported from a surface (14) by flanges (17) extending transversely from the top of the rail (11). The rail has a groove (16) for the road wheels. The rail is recessed into the road surface in a relatively shallow recess (12). The rail has a low profile since the loading on the rail is taken on the surface and is not carried down as usual to a substrate for the surface.

* See back of page

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RAIL

FIELD OF THE INVENTION

The present invention concerns rails for railways and tramways.

BACKGROUND OF THE INVENTION

The rails for a railway are I-beams supported by transverse sleepers on a bed of ballast on a prepared base. Where a road crosses a railway, the surface of the road is level with the tops of the rails, and the space between the rails is then built up. These rails are so-called high profile rails. For street railways a similar high profile rail is usually used. Thus, tramways used a so-called phoenix rail which is generally an I-beam but with a groove for the train wheels formed in the upper flange. To install such a rail in a road, it is necessary to excavate the road surface to a depth of at least 50 centimetres to provide for a sleeper or bed of concrete under the rail which itself would be 18 centimetres depth. Such a deep excavation entails re-routing underground services such as water and electricity mains and destroys the integrity of the road construction. A way of reducing the cost of installing such rails was developed in Dresden, East Germany in the late 1950's in which the rail was pre-cast in a concrete panel serving as a sleeper and then the roadway had merely to be excavated to receive the panel which was about 20 centimetres deep. One of the disadvantages of this system is that the rails are permanently installed in the panels and so must be of the same length of the panels and thus the rails have to be welded together to form a reasonable length. Another system was developed in Budapest by Dr. Zahumensky in which the panels are provided with steel lined channels and are rather shallower at 18 centimetres and separate rails are then located in the channels of adjoining panels by means of mechanically squeezed in rubber blocks. So the panels can be handled, the depth of the rails is small at say 7 centimetres, leaving a web of 11 centimetres between the bottom of the channel and the bottom of the panel.

A snag with panel systems is that the panels have a tendency to settle or rock unless the sub-soil is very firm; this is resisted in the East German system by the rigidity of the phoenix-type track.

The rails are subjected to the loading of trains along the track, loads due to traffic crossing, and loads on curves and at rail intersections. Where loads are too large for the panel systems, it is possible to use transitional sections to traditional phoenix constructions but it is desirable to keep such phoenix constructions to a minimum.

Modern roads in cities where light railways are more likely to be used are built to high standards capable of carrying 40 tonne vehicles with 11 tonne wheel loadings. These are expensive to construct and it is the aim of the present invention to keep excavation of such roadways to a minimum by providing an improved rail.

SUMMARY OF THE PRESENT INVENTION

One aspect of the present invention provides a rail comprising a bar portion having a wheel groove in the surface that will be uppermost in use characterised by a pair of flanges extending integrally from that bar portion to spread the wheel loading on the bar which flanges are at the top of the said bar portion.

Another aspect of the invention provides a rail comprising a bar portion having a wheel groove in the surface that will be uppermost in use characterised by at least one flange towards that grooved surface extending integrally sideways from the bar portion.

A further aspect of the present invention provides a roadway having inserted in it a rail characterised in that the rail has integral bar and flange portions with the bar portion recessed in the roadway and each flange portion overlying the road way on either side of the bar portion.

The flanges serve the functions of spreading vertical loading, gripping the roadway to resist cross-loading, and to minimise damage to the roadway due to water leaking down the sides of the bar portion.

A yet further aspect of the present invention provides a rail comprising a bar portion having a wheel groove in the surface that will be uppermost in use characterised by a pair of flanges extending integrally from that bar portion towards the top of the bar portion.

Again the present invention provides a roadway having such a rail installed in it, the flanges being recessed into the roadway.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a section of a rail fitted in a roadway,

Figure 2 is a perspective view of a pair of rails fitted in a roadway, and

Figure 3 is a perspective view showing a rail intersection.

DESCRIPTION OF AN EXEMPLARY EMBODIMENT

Figure 1 illustrates on a large scale a rail 11 recessed into a shallow recess 12 in a roadway 14 or other suitable surface. The recess can be for example 4 centimetres deep and 10 centimetres wide. the rail has a central bar portion 15 which is generally a regular trapezium in section but with a groove 16 for a vehicle wheel in the wider surface which in use is the uppermost surface of the bar portion. Extending integrally sideways from the bar portion, there is a flange 17 on each side of the rail. The rail can be of steel, iron or another material rolled, extruded or otherwise fabricated into the squat T-shape illustrated. The recess is preferably cut out by suitable cutters such disc or other cutters cutting the edges of the slot-like recess with a plane or other cutter removing the material remaining between the original cuts. As shown in Figure 2 a pair of rails will normally be used and the recesses can be cut using ganged cutters to ensure correct spacing. Returning to Figure 1, the recess is generally rectangular in section and is partially filled with a suitable material 18 so when a rail is inserted in the recess the rail can be settled into the material 18. Cross ties not illustrated can be provided at intervals to form gauge defining devices and these

can be recessed below the surface. The rail can be secured in place by mechanical or other means such as an adhesive bond which preferably has a degree of resilience such as is provided by Corkelast. It is possible to provide ribs or a shallow groove in the underside of each flange to improve still more the sealing properties of the adhesive and the resistance of the rail to sideways displacement. The rails can be welded or otherwise joined end-to-end to form a continuous track and can be laid under tension to avoid thermal expansion problems. Whilst it might be possible to use a single flange on one side of the rail, this would entail cutting the recess accurately to that vertical loading was taken both on the flange and the base of the rail to avoid the rail tending to twist. The width of the flange or each flange would be large enough bearing in mind the load bearing capacity of the substrate to avoid excessive settlement.

Figure 2 shows a pair of rails installed in a roadway. To avoid crossing road traffic or two wheeled road vehicles such as pedal and motor cycles being inconvenienced by the smooth metallic bumps formed by the rails, the space between the rails 11 is built up to the level of the rails by a thin layer of tarmac 20 or other road facing material. It would be possible to recess the flanges slightly in the road surface so that they are substantially flush with the road way and then merely fill the seam alongside the flanges with tarmac or the like. It would also be possible to have the flanges slightly down from the top of the rails with the top of the rails flush with the roadway with the tarmac or other material on top of the flanges to minimise the amount of metal exposed.

Figure 3 illustrates a junction piece which would be cast or otherwise formed and comprises two rails 21 and 22 crossing at an angle with the grooves in the two rails extending across the central intersection 23. Where more complicated arrangements are involved such as junctions, special provisions might be made

such as the provision of sections of conventional phoenix tracks but a suitable adaptation of Figure 3 is possible.

The present invention is mainly for use where road vehicles and track vehicles share road space. Such situations arise where there are tramways or light urban railways. The invention can be used even when such tramways or urban light railways run on segregated tracks and even for mainline railways. Where segregated tracks or mainline railways are involved the roadway in which the rails are laid can be made of heavy concrete or stone slabs or panels or even on a continuous concrete bed laid in situ; with such concrete roadways there would have to be expansion joints but the recesses can be formed during manufacture or laying wet concrete. For example the recesses can be formed by a slip-form paviour or other machine. The low profile rail according to the present invention offers advantages due to the reduction in rail height over traditional railway track especially when a track is being adapted for electrification or gauge conversion since it would not be necessary to lower an existing track bed possibly exposing wall foundations in existing tunnels.

The rails can be used for signalling or electric power supply if the rails are insulated. However it is probably not possible to supply sufficient power to drive a vehicle in this way but only to use the rails as a return path and then it would be desirable to bond the rails to a low resistance earth cable at intervals to avoid earth leakage currents interfering with other services.

The cross-section of the rails depends on the use. The groove is shaped to suit the intended traffic and can for example not only engage those wheels supporting a vehicle but also steering wheels which engage the groove and transmit steering information to the supporting wheels. The central bar portion would be deep enough to provide an adequate groove and typically would be about 7 centimetres deep with 4 centimetres recessed in the road-way, and would be typically 10 centimetres wide with the

flanges extending further out by sufficient distance bearing in mind the substrate load-bearing capacity to suspend the rails from the roadway so the vertical and horizontal loading on the rails is taken on the upper surface of the roadway without appreciable settlement unlike the previous systems wherein the vertical loading was taken to the bottom of the rails.

Even when the flanges are offset or recessed down the bar portion and the flanges as well as the bar portion are recessed in the roadway, the vertical loading is taken near to the top surface of the roadway. It is thought that having the flanges recessed into the roadway will only be practical when the recesses are preformed during roadway laying or when the rails can be laid during roadway construction with the final surfacing burying the flanges without raising the intended level of the roadway.

C L A I M S

1. A rail comprising a bar portion (15) having a wheel groove (16) in the surface which will be uppermost in use characterised by a pair of flanges (17) extending integrally from that bar portion to spread the wheel loading on the bar which flanges are at the top of said bar portion.

2. A rail comprising a bar portion (15) having a wheel groove (16) in the surface that will be uppermost in use characterised by at least one flange (17) towards that grooved surface extending integrally sideways from the bar portion.

3. A rail comprising a bar portion (15) having a wheel groove (16) in the surface which will be uppermost in use characterised by a pair of flanges (17) extending from towards the top of the bar portion.

4. A roadway having inserted in it a rail characterised in that the rail (11) has integral bar (15) and flange (17) portions with the bar portion recessed in the roadway and each flange portion overlying the roadway on either side of the bar portion.

5. A roadway according to claim 4 wherein the space between recess and the bar is filled with material (18).

6. A roadway according to claim 4 or claim 5 wherein the rail is secured in place by mechanical or other means.

7. A roadway according to any one of claims 4 to 6 wherein the flanges seal onto the road surface.

8. A roadway according to any one of claims 4 to 7 with a pair of rails spaced apart with the roadway between the rails built up to the level of the top of the rails.

9. A roadway according to any one of claims 4 to 8 wherein the rails are formed from lengths welded together to form a continuous rail and installed under tension.

10. A roadway according to any one of claims 4 to 9 fitted with a junction piece for two rails crossing at an angle comprising an integrally cast or otherwise formed member consisting of intersecting bar portions

(21 and 22) crossing at an angle with the grooves in the two bar portions extending across the central intersection.

11. A roadway according to any one of claims 4 to 10 fitted with a junction for two rails crossing at an angle which junction is formed of phoenix track.

12. A roadway according to any one of claims 4 to 11 wherein each bar section is roughly 7 centimetres deep with 4 centimetres recessed into the roadway and roughly 10 centimetres wide with the flanges extending further out by sufficient distance bearing in mind the load bearing capacity of the roadway surface to suspend the rail from that roadway surface without appreciable settlement.

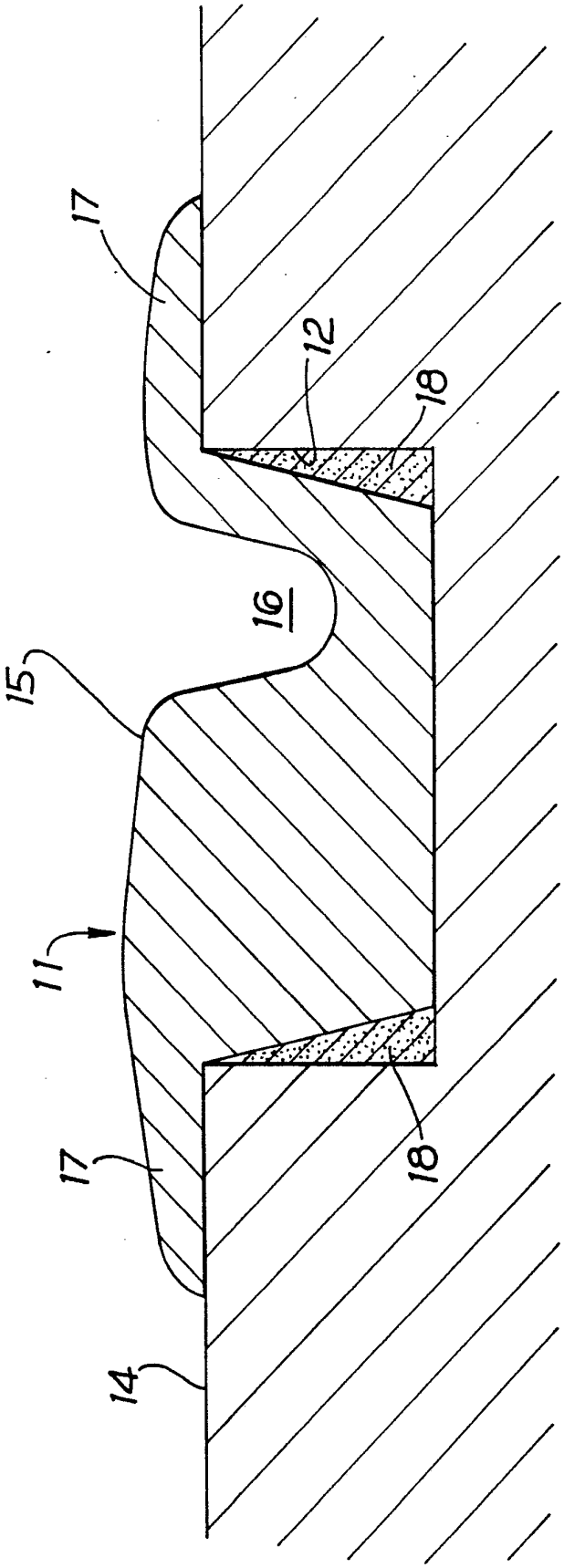

Fig. 1

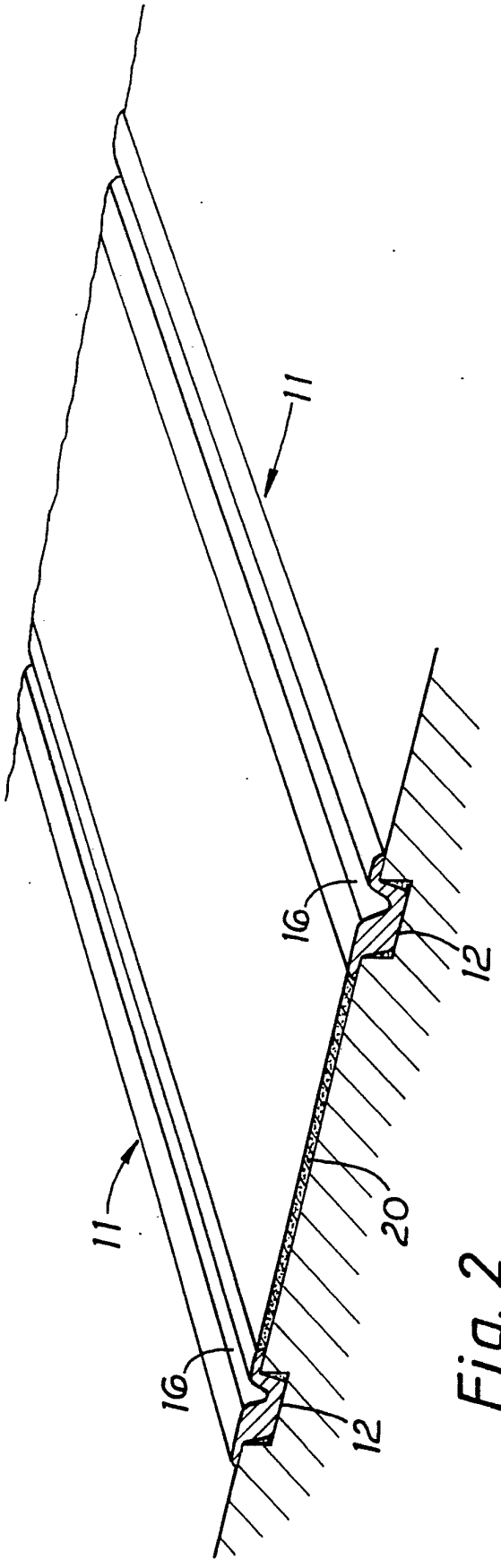

Fig. 2

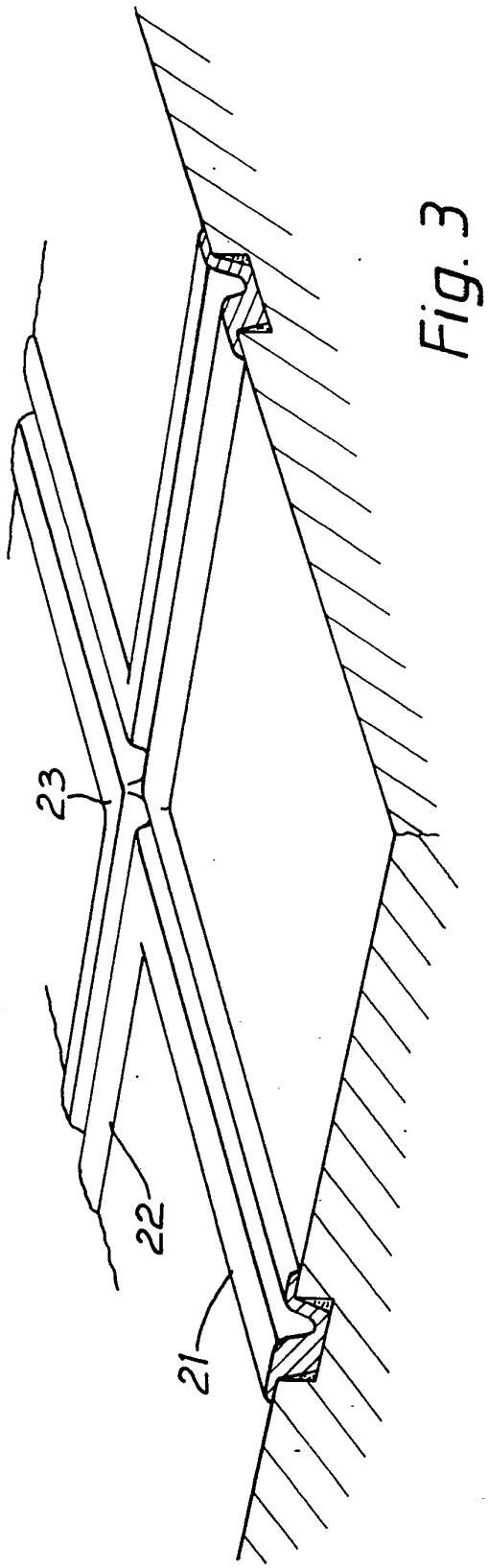

Fig. 3

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 90/01325

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 E01B5/04 ; E01B7/28

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	E01B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
X	WO,A,8400391 (BÖNSTRÖM) 02 February 1984 see page 1, lines 1 - 7	1-5, 8
Y	see page 2, lines 1 - 33	9-11
A	see page 3, lines 20 - 37 see page 5, lines 2 - 9; claim 1; figures 1, 2	6, 7, 12
X	US,A,3089650 (RASKIN) 14 May 1963 see column 1, line 70 - column 2, line 13; figure 2	1, 3
Y	FR,A,2574496 (GEISMAR) 13 June 1986 see page 1, lines 1 - 13; claim 8	9
Y	FR,A,555915 (ACIERIES DE GENNEVILLIERS) 9 July 1923 see page 2, lines 33 - 61; figure 1	10, 11
A	FR,A,2277934 (GIROUD) 06 February 1976	

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
07 DECEMBER 1990	18. 12. 90
International Searching Authority	**Signature of Authorized Officer**
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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB9001325

SA 39879

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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