May 14, 1968 YOSHIRO HIGUCHI ETAL 3,382,815

METHOD OF CONSTRUCTING RAILWAY TRACK

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FIG. 1

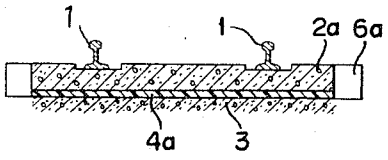


FIG. 3

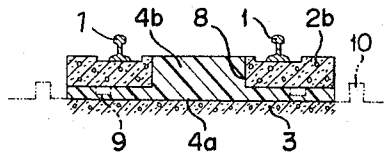


FIG. 2

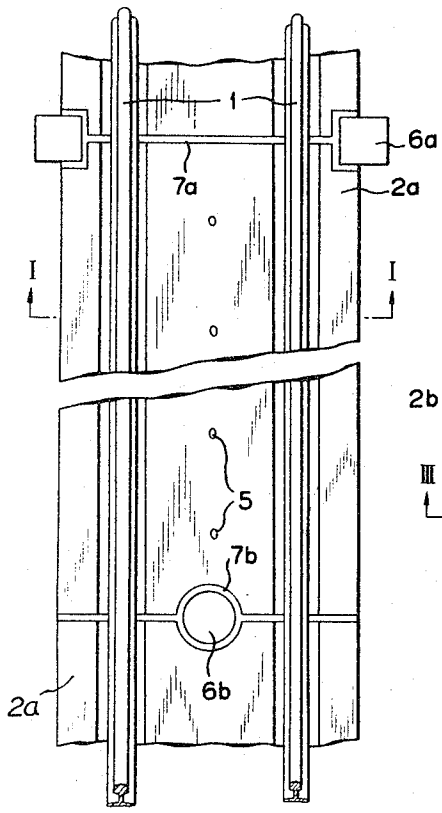
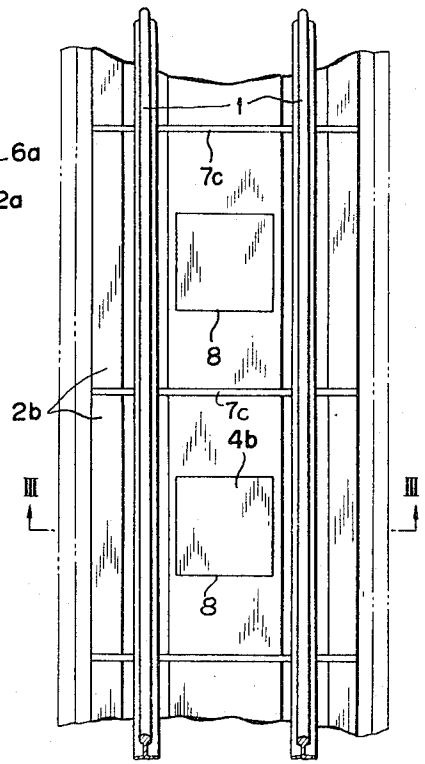


FIG. 4



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FIG. 5

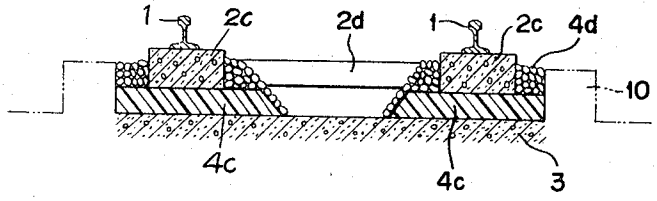
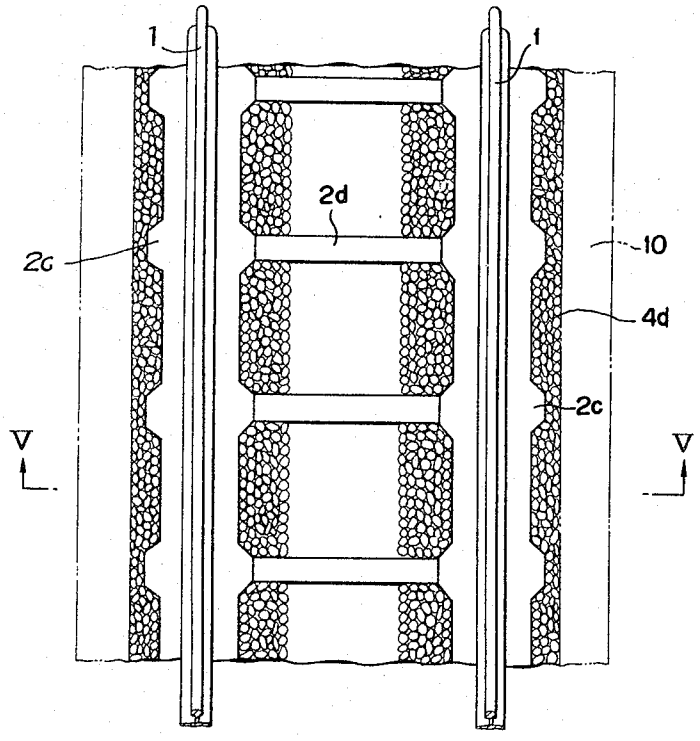


FIG. 6



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METHOD OF CONSTRUCTING RAILWAY TRACK

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3 Claims. (Cl. 104—3)

ABSTRACT OF THE DISCLOSURE

The disclosure deals with a method of constructing railway track, according to which there is provided a rail assembly of a mounting member or slab and thereto secured rails, arranging the rail assembly above a base in height and direction adjusted position, and applying between the base and rail assembly an intermediate support, such as grout, for the assembly.

The present invention relates to a method of constructing railway track.

For constructing track on a concrete base in a tunnel or on an elevated line or the like, a construction with ordinary ballast has been conventionally applied and in some special cases a construction without ballast has also been applied where the rails have been fastened directly to a concrete base. The former has drawbacks in that a large amount of ballast produces a great dead load and requires a considerable amount of track maintenance work which is caused by loosening and dirtying of ballast. The latter also has drawbacks in that some means is required to provide such resiliency as is afforded by ballast, that adjustment is not easier than in the case of ballast, and that repair of deformation in the concrete base and other parts is extremely difficult.

Various proposals have been made for slab system track constructions, all of which have been designed to provide adjusting portions for equal distances of track in order to keep adjustment of the track at a minimum and to withstand forces in the direction of the rails and lateral pressure due to temperature and other causes in these adjusting portions, and it is an advantage of this system that it requires relatively few of such adjusting portions for a given track length. However, this system has some drawbacks in that the ends of a slab are used for supporting the slab itself, the larger the length of a span the greater is the required thickness of the slab and also its cost, and in order to withstand operational forces and pressures the adjusting portions become rather complicated and expensive.

The present invention has for its object to provide a railway track, and a method of constructing the same, by which the aforementioned disadvantages are obviated, track maintenance work is kept at a minimum, the construction is simple and readily installed, and adjustment of the track is made easy.

According to the present invention, a method of constructing railway track comprises forming a base on which is positioned an assembly of a mounting member and thereto secured rails, arranging the assembly on the base in raised and adjusted position, and providing supporting material between the assembly and the base.

In order that the present invention may be clearly understood and readily carried into effect it will now be more fully described with reference to the accompanying drawings, in which:

FIGS. 1, 3 and 5 are cross-sectional views of three embodiments of the present invention and

FIGS. 2, 4 and 6 are plan views thereof.

Referring now to FIGS. 1, 2, 3 and 4, the reference numeral **1** designates rails, **2***a* and **2***b* are rail mounting members in the form of concrete slabs, **3** is a firm base, **4***a* is an interposed layer of grout, **5** are injection openings in the mounting slabs **2***a*, **6***a* and **6***b* are projections, **7***a*, **7***b* and **7***c* are packings, **8** is an opening in the mounting slabs **2***b*, and **9** and **10** are holding elements.

In FIGS. 1 and 2, the rails **1** are secured with conventional rail fastenings to a prefabricated concrete slab **2***a*, and this rail assembly is thereafter mounted on the concrete base **3**. After placing the rail-carrying slab **2***a* on suitable spacers on the base **3** at the proper rail level and on rail alignment of the slab, the space between the concrete slab **2***a* and the concrete base **3** is charged or filled with grout **4***a* which may consist of cement, asphalt, sands, for example, instead of ballast. If the concrete slab **2***a* is rather long, it is preferable to provide the injection openings **5** for applying the grout. In order to take up the operational forces of the rails **1**, there are provided on the concrete base **3** either upward projections **6***a* at both sides of the rails or upward projections **6***b* between the rails (FIG. 2), said projections being preferably of concrete. The projection **6***b* may be cylindrical or of any other suitable section. By inserting packing **7***a* or **7***b* between these projections **6***a* or **6***b* and the concrete slabs **2***a* and between the concrete slabs themselves, it is possible to move and thereby adjust the position of the concrete slab **2***a* to the left or right as well as forward and rearward.

In FIGS. 3 and 4, which show another embodiment of the invention, the concrete slabs **2***b* may be members with apertures **8**. The grout **4***a* may be introduced between the raised concrete slab **2***b* and the concrete base **3** in the same manner as described with reference to FIGS. 1 and 2, and the grout **4***a* also fills the center aperture **8** of the slab **2***b*. The operational forces in the rails **1** are taken up by the grout projection **4***b* in the center aperture **8**. There may also be provided a holding element **9** on the under-surface of the concrete slab **2***b*, or holding elements **10** on the base **3**, for taking up longitudinal and lateral forces from the rails **1** (FIG. 3). The holding elements **9** or **10** may be of concrete or may be steel elements embedded in the concrete slab **2***b*.

For height adjustment of the track and consequent raising of the concrete slabs **2***a* or **2***b* from the base **3**, it is not desirable that the grout **4***a* be applied to fill the space therebetween to its full height, and it is preferred that paper or asphalt or the like be provided on the undersurface of the raised slabs **2***a* or **2***b* as an intermediate layer. When injecting the grout **4***a*, it is, of course, necessary to provide suitable side forms, such as the holding rails **9** or **10** or other means, to avoid escape of the grout **4***a* sideways on the base **3** as it is being applied.

When any change in the height of the installed track is indicated, the concrete slab or slabs **2***a* or **2***b* may be raised to the correct position and the ensuing space therebeneath filled with grout, with packing being inserted between the concrete slabs and the holding elements.

Suitable grout for connecting the concrete slabs and the base was found to be a mixture of cement, cation-type asphalt-emulsion, water and a nonion-type surface active agent. The suitability of acidic cation-type emulsion for the purpose was quite remarkable, because such emulsion will usually solidify instantaneously when mixed with alkaline liquid, such as cement paste, for example. The low strength of such cement-asphalt grout together with its small modulus of elasticity afford an entirely satisfactory cushioning effect. Bentonite and aluminum were found effective for reducing bleeding and obtaining slight expansion.

Two examples of such grout are shown below:

Cation-type Asphalt emulsion (for mixing) (kg.)	75
Nonion Agent (liter)	1.125
Water (kg.)	31.9
Bentonite 10% solution (liter)	3.75
Portland cement (kg.)	37.5
Aluminum power (gram)	7.5
Sand (kg.)	75

Cation-type Asphalt emulsion (for penetration) (kg.)	105
Nonion Agent (liter)	2.6
Water (kg.)	1.6
Portland cement (kg.)	52.5
Aluminum powder (gram)	7.8
Sand (kg.)	52.5

Fibres, such as nylon or vinyl chloride, were found effective for obtaining toughness of the grout.

Rail height adjustment by raising concrete slabs is easily achieved by driving small steel wedges between these slabs and the hardened cement-asphalt grout mixture. Spraying oil or paraffin liquid under the concrete slabs before initial application of cement-asphalt grout facilitates subsequent stripping of concrete slabs therefrom for rail adjustment.

A further embodiment of the invention is illustrated in FIGS. 5 and 6, in which numeral **1** designates rails, *2c* and *2d* are longitudinal and transverse parts of a rail mounting member, **3** is a concrete base, *4c* are intermediate layers such as asphalt ballast, and **10** are holding elements on the concrete base **3** for holding the layers *4c*.

The method of constructing this particular railway track is as follows:

(1) There is arranged an area on the concrete base **3** for receiving a rail assembly.

(2) There is preformed a rail assembly having rails **1** mounted on a rail mounting member consisting of longitudinal parts *2c* and transverse parts *2d* of various cross-sections, or in lieu thereof there is preformed any conventional rail assembly;

(3) There is applied asphalt ballast *4c* at the spaced places on the concrete base **3** on which the rail assembly is subsequently positioned, and asphalt ballast *4d* is then applied over the ballast *4c* between the parts *2c* of the rail mounting member and said places on the concrete base **3**.

The asphalt ballast *4d* in this track construction may consist of resilient synthetic resin or the like and characteristic features thereof are as follows:

(1) Since the track ballast is of small bulk, it is less of a dead load;

(2) Asphalt ballast *4c* and *4d* facilitate track maintenance work;

(3) Since transverse rail forces are absorbed by the side rails **10** on the concrete base **3** through intermediation of the ballast, stability of the track is quite high;

(4) In contrast to directly anchored rail constructions, the construction of the present assembly is simple and its repair quicker and easier;

(5) Since in the present construction the asphalt ballast *4c* has resilient properties, the construction has greater spring effect than one which depends merely on pads or springs for such effect, as in the direct-tie construction, for example;

(6) Since open space is provided in the middle of the rail assembly, it is not only possible to keep its weight low, but also facilitate track maintenance of the asphalt ballast.

To facilitate maintenance work, the surface layer of the asphalt ballast *4c* only may be asphalt-coated.

The invention is not restricted to the particular features of the embodiments hereinbefore described, since alternatives will readily present themselves to one skilled in the art.

What is claimed is:

1. A method of constructing railway track, which comprises provided a rigid base; forming an assembly of two rails and a support therefor by securing said rails in correct spaced parallel relation to said support; holding the entire assembly with its support next to, but above and spaced from, the base, and while so holding the assembly spaced from the base adjusting its position for correct track level and direction; while holding the entire assembly in adjusted position above and spaced from the base, filling the space between the base and the support of the assembly with grout which will solidify on drying; and continuing to hold the assembly in adjusted position above and spaced from the base until the grout has solidified so that on release of the assembly the same rests directly on the solidified grout.

2. A method of constructing railway track as in claim **1**, which further comprises casting the support of the assembly as a concrete slab with apertures, and the grout is injected in the space between the base and slab through the apertures in the latter.

3. A method of constructing railway track as in claim **1**, in which the grout is poured into said space as a mixture of cement, cation-type asphalt emulsion, nonion surface active agent, mineral particles and water.

References Cited

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