



US 20070176013A1

(19) **United States**(12) **Patent Application Publication**
Pohlmann(10) **Pub. No.: US 2007/0176013 A1**(43) **Pub. Date: Aug. 2, 2007**(54) **DEVICE FOR ADJUSTING THE POSITION
OF A RAIL OR A TRACK UNIT
COMPRISING AT LEAST ONE RAIL
RELATIVE TO THE SUPPORTING ROAD
BED****Publication Classification**(51) **Int. Cl.**
E01B 1/00 (2006.01)
(52) **U.S. Cl.** **238/6**(76) **Inventor: Marko Pohlmann, Berlin (DE)**Correspondence Address:
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ROSLYN, NY 11576 (US)(21) **Appl. No.: 11/587,280**(22) **PCT Filed: Apr. 29, 2004**(86) **PCT No.: PCT/EP04/04557**§ 371(c)(1),
(2), (4) **Date: Oct. 23, 2006****ABSTRACT**

The invention pertains to a device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road bed.

In this case, a simple and efficient adjustment should also be possible in the banked regions of track curves. The adjusting device should furthermore remain unaffected by possible length changes of the rails such that it can also be easily removed from the concrete track plate if significant length changes occur.

This is achieved in that the device consists of at least one fixing element (2) that directly engages on the rail (1) and is supported on the supporting road bed by means of at least one connecting element (3) that can be tilted about an axis extending parallel to the longitudinal axis of the rail (1).

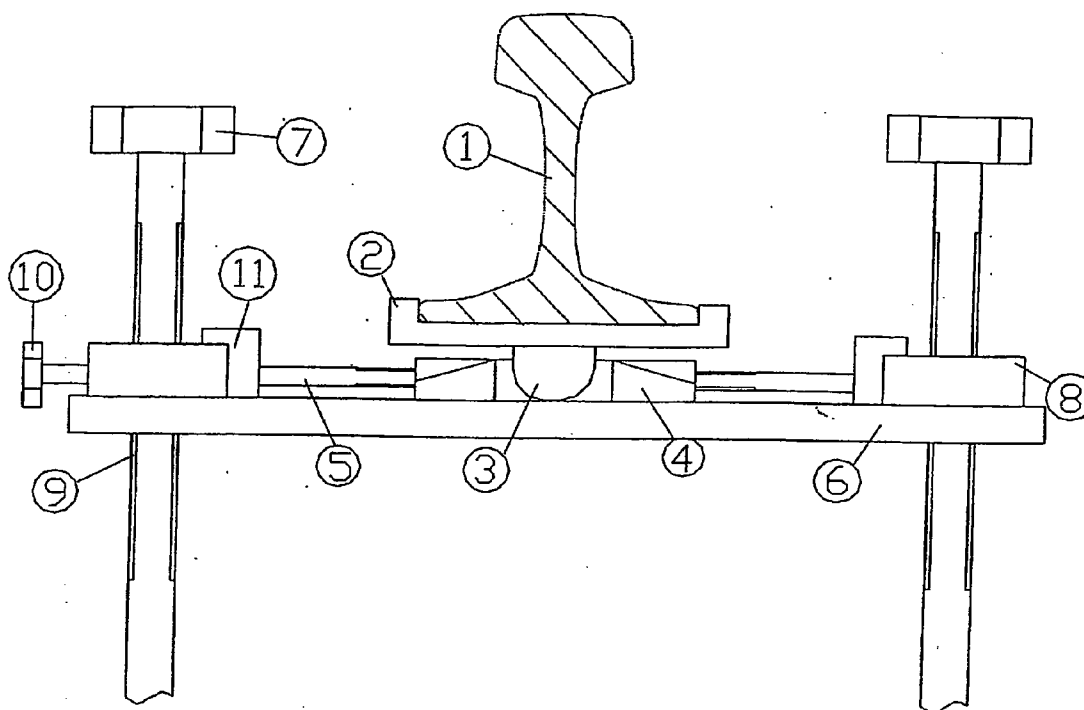


Fig. 1

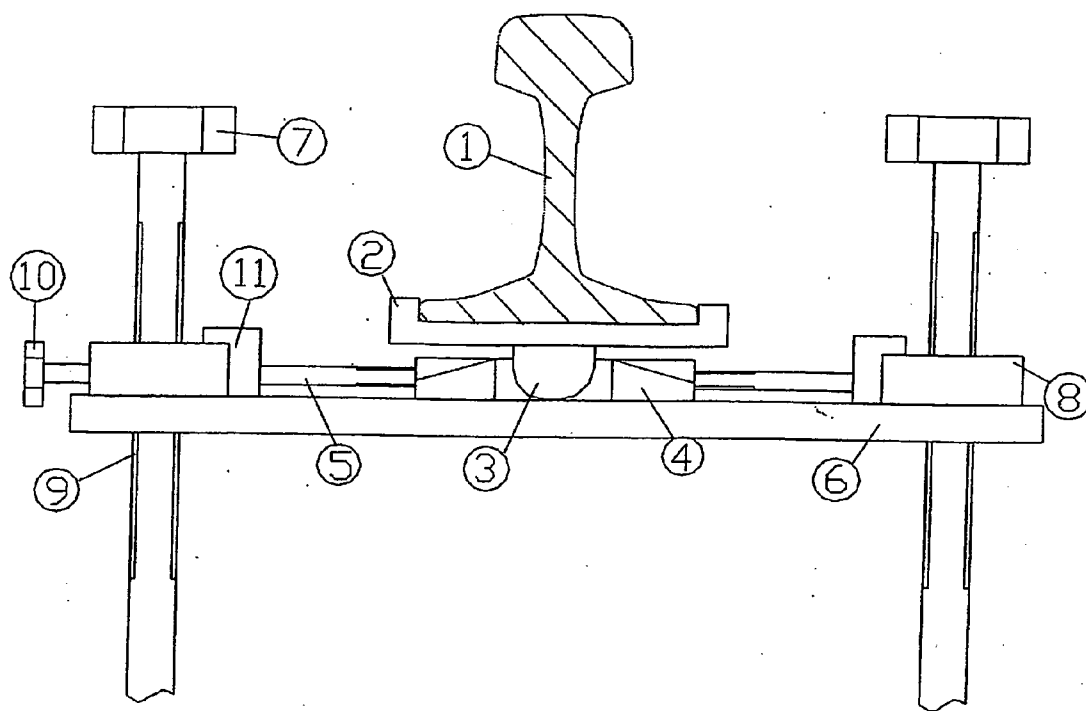
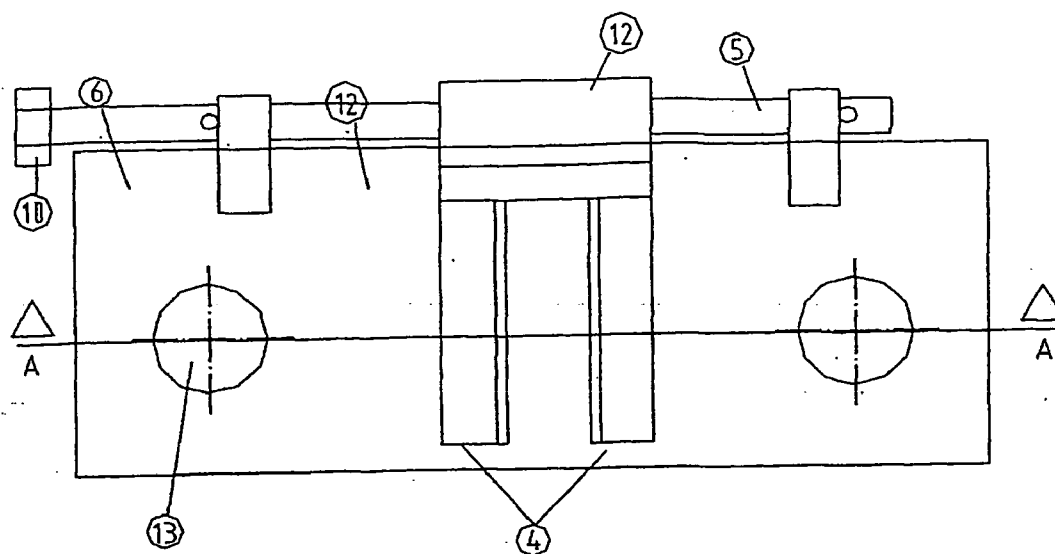


Fig. 2



Section

A-A

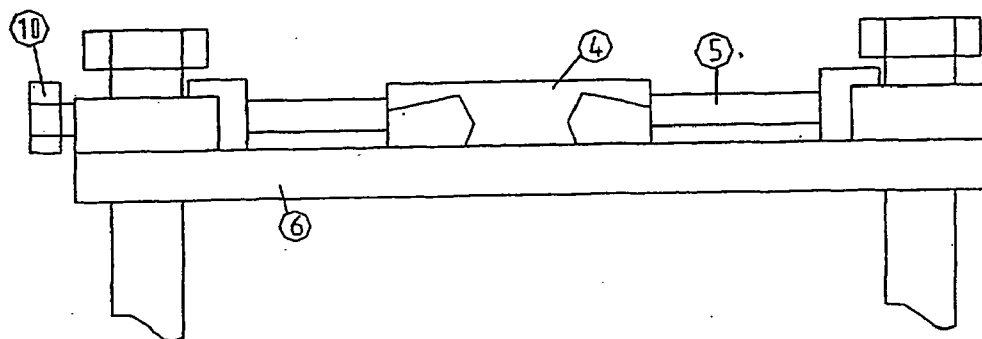
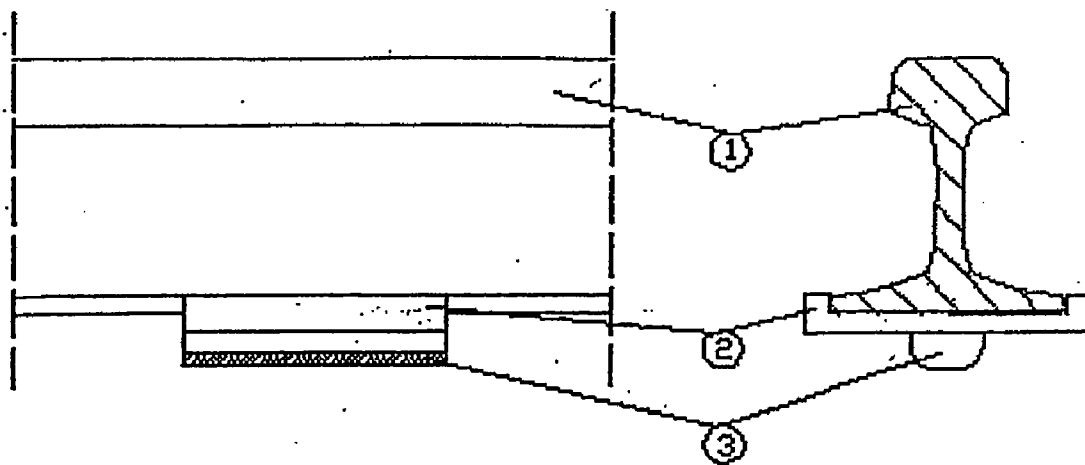


Fig. 3



**DEVICE FOR ADJUSTING THE POSITION OF A
RAIL OR A TRACK UNIT COMPRISING AT
LEAST ONE RAIL RELATIVE TO THE
SUPPORTING ROAD BED**

[0001] The invention pertains to a device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road bed.

[0002] In track systems for railborne vehicle traffic, ballastless systems proved advantageous in certain applications and operating conditions in the past decades. During the course of various developments activities, a broad variety of different technical approaches were proposed and evaluated with respect to their suitability for use in practical applications. In addition to systems in which the support points for receiving the rails are already integrated into prefabricated concrete parts at the factory (e.g., rigid track of the type "Bögl"), systems in which a track unit consisting of rails, track unit mounting material and crossties is fixed, in particular, by means of a casting material introduced in-situ—usually site-mixed concrete or asphalt—have also become quite popular (e.g., rigid track of the type "Rheda").

[0003] One particular problem in these site-mixed concrete systems proved to be the adjustment of the track unit on the supporting road bed before the introduction of the casting material. The track unit needs to be held such that a stable position with respect to its horizontal and vertical adjustment is ensured while the casting material is introduced. Subsequent corrections of the position of the cast-in track unit can—if at all—only be realized with extremely high technical and financial expenditures. Only very few correction or compensation options with respect to the track position are available in rigid tracks. In certain instances, the only available option is demolition and reconstruction.

[0004] Different variations for adjusting a track unit realized in accordance with the above-described type "Rheda" are known from the prior art:

[0005] DE 102 36 535 discloses a method, in which the track unit to be adjusted is initially laid out on the reinforcing layer of the track plate to be manufactured with site-mixed concrete after the adjusting process and roughly adjusted to the required height by means of vertical spindles. These spindles engage into threaded sheets that are welded into the reinforcing layer, for example, in the region of each third crosstie. In order to adjust the track unit in the transverse direction, a support tube is installed in the base layer of the rigid track in the track axis and approximately at the position of each vertical spindle measured in the longitudinal direction of the track, namely such that it protrudes from said base layer. Adjusting crossbeams are respectively attached to these support tubes. The adjusting crossbeams feature grippers that are aligned horizontally and can be extended as well as retracted by means of a crank gear, wherein said grippers contact the crosstie concrete body and are able to displace this concrete body transverse to the longitudinal track axis. Consequently, the crossbeam that is rigidly anchored in the subsoil exerts pressure upon the crossties and thusly displaces the entire crosstie and therefore the entire track unit transverse to the track axis. In this method, the high expenditure of labor for realizing the support tubes provided for fixing the crossbeams proved particularly disadvantageous: pocket holes need to be produced in the base layer and blown out, and the support tubes

need to be cast in mortar. In addition, numerous threaded sheets (for the vertical spindles) and forked sheets (for fixing the support tubes) need to be welded into the reinforcing layer. However, no information is provided as to what happens to the support tubes encased in concrete after the manufacture of the track plate. In this respect, DE 102 36 535 proposes the utilization of a support tube that can be divided at the height of the upper edge of the track plate by means of a predetermined breaking point. In any case, components remain in the region near the surface of the track plate and may develop from disturbance variables into potential sources of damages during the subsequent period of operation. Other disadvantages can be seen in that the adjustment and the support are realized in the region of the crossties while the actual measurement takes place on the rail surface. The spatial offset between the measuring site and the adjusting site results in a more difficult and costly adjustment. The horizontal and vertical adjusting processes influence one another, particularly in the region of banked curves, because an adjustment of the height always results in an inevitable drift of the lateral position (and vice versa). The adjustment of the nominal values indicated in plane (two-dimensional) coordinates therefore becomes much more difficult and requires multiple reversing adjustment processes that may result in a series of unsuccessful attempts depending on the experience of the operator. In any case, the attainable qualitative result suffers significantly in this approach to solve the adjustment problems. At this point, it also needs to be mentioned that this method is very personal-intensive because three operators are required for the sites (vertical axis, horizontal axis, measuring site) that spatially lie relatively far apart from one another.

[0006] Another option for adjusting the position of the track unit is known from DE 101 31 655. In this case, adjusting portals are used that are supported on the base layer and raise and adjust the rails of the track unit by means of rail head tongs. The adjusting portals need to be non-positively connected to the road bed by means of screws or dowels and span the exposed track unit. Consequently, a large number of extremely bulky adjusting portals need to be installed on a section of a track unit to be adjusted. Due to their dimensions, these portals cannot be moved manually, wherein additional lifting and transport means are required for handling the portals. Due to the complicated construction, these devices also tie up much additional capital. In order to achieve the desired capacity of several hundred meters per day, a large quantity of these capital-intensive portals needs to be procured and held in storage. These portals cannot be used in the region of switches because they are no longer able to span the width of the track unit at these locations due to their constructive design. These portals also cannot be used in spatially restricted surroundings, for example, in tunnels or in exit-and-entry structures.

[0007] A similar device is known from DE 199 23 329, wherein this device also comprises portals that span the entire width of the track unit. This solution also utilizes rail grippers that, in contrast to the solution known from DE 101 31 655, downwardly engage underneath the rails from the portal. The disadvantages cited in connection with DE 101 31 655 also apply to this device in their entirety.

[0008] A third known solution developed by the firm "Pfleiderer" (see company pamphlet "Rheda 2000" of Pfleiderer AG, Neumarkt/Oberpfalz, April 2003/A01/

0280879/1/04.03.) proposes to utilize spindle consoles only, wherein said spindle consoles are mounted on both rails of the track unit in fixed intervals along the longitudinal rail axis—usually in each third space between crossties. Such a spindle console essentially comprises a base plate that non-positively and positively engages underneath the rail base. A vertically oriented threaded bolt is guided through a threaded bore in the base plate and supported in a pocket hole in the base layer of the rigid track.

[0009] In this case, it is disadvantageous that this solution cannot solve the problems with respect to the mutual influence of horizontal and vertical adjustments when carrying out adjusting processes in curves. An adjustment of the height in the banked regions of track curves always results in an inevitable drift of the lateral position (and vice versa). Consequently, the adjustment of the nominal values indicated in plane (two-dimensional) coordinates becomes very difficult and requires multiple reversing adjustments that can lead to a series of unsuccessful attempts depending on the experience of the operator. This in turn negatively influences the attainable qualitative result of the adjustment. Another negative aspect of this device can be seen in that the rigid fixing of the rail base on the base plate results in the adjusting device being unable to compensate the length changes of the track unit caused by the thermal expansion of the rails. The vertical spindle stationarily remains underneath the mass of the track unit at its point of contact with the base layer, but the base plate participates in the length change of the rail. This results in uncontrollable deformations in the adjusting device such that the adjusting device is not only rendered unusable, but also can no longer be removed from the concrete track plate if the vertical spindles are bent.

[0010] This problem could obviously be solved by loosening these fixing screws in a timely fashion. However, this still does not solve the problem because the base plates 10 are able to tilt uncontrollably due to their own weight and the one-sided support on the rail base by means of a vertical spindle such that they nevertheless participate in the longitudinal expansion of the rail.

[0011] The invention is based on the objective of making available a device for adjusting the position of a rail or a track unit comprising at least one rail relative to the supporting road bed, wherein said device also allows an efficient and simple adjustment in the banked regions of track curves. In addition, the adjusting device should not be affected by possible length changes of the rails and therefore can also be easily removed from the concrete track plate in case significant length changes occur. The device should furthermore have a small mass such that the manufacture and the transport of the device can be realized as cost-efficient as possible. The measuring site and the adjusting site should also be arranged as close to one another as possible in order to reduce the required personnel.

[0012] In connection with the preamble of claim 1, this objective is attained, according to the invention, in that the device consists of at least one fixing element (2) that directly engages on the rail (1) and is supported on the supporting road bed by means of a connecting element (3) that can be tilted about an axis extending parallel to the longitudinal axis of the rail (1). This represents a renunciation of the approach used so far, namely of rigidly coupling the adjust-

ing axes to the transverse incline of the base layer or the crosstie (as in the track adjustment by means of crossbeams and installation portals in above-described variations 1 and 2 of the state of the art) or the rail (as in the track adjustment by means of spindle consoles in above-described variation 3 of the state of the art). The invention advantageously proposes to realize an adjusting system that is always adjusted horizontally and vertically, namely also in absolute space coordinates, with the aid of a tiltable connecting element. The predetermined nominal values can be efficiently and quickly adjusted without interfering interactions.

[0013] As a supplement to the inventive concept, it is proposed that the or each connecting element (3) that can be tilted about an axis extending parallel to the longitudinal axis of the rail (1) is connected to at least one adjustable adjusting element (5) for horizontally adjusting the rail and/or at least one adjustable adjusting element (7) for vertically adjusting the rail relative to the supporting road bed. Two vertical adjusting elements are preferably used in this case. This makes it possible to reliably hold the fixing element adjoining the rail against the gravitational force without tilting. The superior distribution of the weight over two spindles achieved in this fashion lowers the risk of bending the vertical spindles.

[0014] The invention also proposes that the or each adjusting element (5) for horizontally adjusting the rail drives a slide (4) that can be displaced perpendicular to the longitudinal rail axis and accommodates the tiltable connecting element (3).

[0015] The invention advantageously proposes that the slide (4) is supported on at least one base plate (6) that is guided between at least two adjusting elements (7) for vertically adjusting the rail, namely in a vertical direction referred to the supporting road bed. The base plate forms a plane, along which the slide and therefore the rail supported on this slide can be moved perpendicular to the longitudinal rail axis.

[0016] In this context, it is sensible that the or each base plate (6) features receptacle devices (11) for the adjusting elements (5) for horizontally adjusting the rail, as well as receptacle devices (8) for the adjusting elements (7) for vertically adjusting the rail.

[0017] The or each adjusting element for vertically adjusting the rail is realized in the form of a spindle rod (7) that is non-positively and/or positively connected to the supporting road bed. According to one practical supplement to the basic concept of the invention, the or each adjusting element for vertically adjusting the rail is supported on the supporting road bed by means of a device for preventing a lateral drift caused by the rotation of the spindle rod (7). This device may consist of a drift protection in the form of a granulated sheet, wherein the rounded point of the vertical spindle is seated in the granulation. In case of a more significant incline, it is proposed to utilize a washer with a sheet welded thereon. Drilling in the base layer as well as welding on the reinforcing layer therefore can be advantageously eliminated.

[0018] The or each tiltable connecting element (3) is advantageously realized in the form of an arced support beam that is supported in a fork-shaped recess of the slide (4).

[0019] According to another advantageous supplement to the inventive notion, the or each fixing element (2) is able to carry out a free relative movement between the rail and the fixing element in the longitudinal rail direction. This makes it possible to decouple the adjusting device from thermally induced length changes of the rail. This means that the risk of bending the adjusting devices used in the vicinity of the rail ends under hot atmospheric conditions is also eliminated.

[0020] In this context, the or each fixing element (2) of one advantageous embodiment of the invention is realized in the form of a rail plate that encompasses the base of the rail (1) in a form-fitted fashion. This can be realized, for example, with a U-shaped rail plate.

[0021] The object of the invention is illustrated in the enclosed figures. The figures show:

[0022] FIG. 1, a section through the device according to the invention transverse to the longitudinal rail axis;

[0023] FIG. 2, a top view of the device according to the invention (without rail and support beam); Section A-A in FIG. 2

[0024] FIG. 3, a side view of and a section through the rail and the support beam.

[0025] It should be possible to comprehend the embodiment described below based on these figures:

[0026] The track unit is delivered in spans or assembled on-site and positioned on the HGT (HGT=hydraulically bound base layer) at the beginning of the inventive adjusting method. The track unit itself is conventionally composed of rails of the type UIC 60 (1) and crossties of the type B 355. An adjusting device according to the invention is positioned on the underside of the rail base in the center—referred to the longitudinal rail direction—of each third space between crossties. In this case, a completely pre-assembled base plate 6 is placed into the free space between the rail and the base layer. The pre-assembly of the base plate can be carried out beforehand in preparation for the actual work on the track unit. It includes a welded connection produced between the base plate (2) and the support beam (3), the screwing of the horizontal spindle (5) into the guide bushing (11) of the base plate and into the slide (4), as well as the fitting of the support beam into the fork-shaped receptacle device of the slide.

[0027] This partial device is held against the rail base from the bottom while both vertical spindles (7) are simultaneously screwed into the threaded nuts (8) of the base plate provided for this purpose and then spindled down until they come in contact with the base layer. In this context, an additional drift protection in the form of a granulated backing sheet is respectively placed into the contact region between the base layer and the spindle points. This prevents the vertical spindles from drifting laterally in the region of the transversely inclined base layers (banked region of a track curve) during the adjustment due to their own a rotational movement.

[0028] The adjusting device can now be horizontally or vertically adjusted with respect to the absolute space coordinates in the region of banked tracks by utilizing the support beam. The inventive device therefore is always situated “in water” regardless of the inclination of the base

layer. As soon as this adjustment is completed, the fine-adjustment can be carried out with the aid of the spindle nuts (10) and the spindle screw (7), respectively.

[0029] After manufacturing the track plate with site-mixed concrete, the vertical spindles can be screwed out the track plate after a defined hardening time such that the weight of the track unit is transferred to the track plate. Subsequently, the base plate with the horizontal spindle, the slide and the track plate can be pulled out transverse to the direction of the track through the intermediate space remaining between the lower edge of the rail and the upper edge of the track plate. The holes left in the track plate by the vertical spindles are filled with a special mortar and smoothed. The components of the drift protection remain in the interior of the track plate that is situated distant from the surface as lost parts.

LIST OF REFERENCE SYMBOLS

- [0030] 1 Rail profile UIC 60
- [0031] 2 Rail plate
- [0032] 3 Support beam
- [0033] 4 Slide
- [0034] 5 Spindle for horizontal adjustment and interlock
- [0035] 6 Base plate
- [0036] 7 Spindle screw for vertical adjustment and interlock
- [0037] 8 Welded-on threaded nut
- [0038] 9 Trapezoidal thread
- [0039] 10 Spindle nut for horizontal adjustment and interlock
- [0040] 11 Guide bushing
- [0041] 12 Threaded nut on slide
- [0042] 13 Bore for spindle screw for vertical adjustment and interlock

1-11. (canceled)

12. A device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road bed, wherein the device consists of at least one fixing element (2) that directly engages on the rail (1) and is supported on the supporting road bed by means of at least one connecting element (3) that can be tilted about an axis extending parallel to the longitudinal axis of the rail (1) and is connected to at least one adjustable adjusting element (5) for horizontally adjusting the rail and/or at least one adjustable adjusting element (7) for vertically adjusting the rail relative to the supporting road bed, wherein the or each adjusting element (5) for horizontally adjusting the rail drives a slide (4) that can be displaced perpendicular to the longitudinal rail axis and accommodates the tiltable connecting element (3).

13. The device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road bed according to claim 12, wherein the slide (4) is supported on at least one base plate (6) guided between at least two adjusting elements (7) for vertically adjusting the rail in a vertical direction referred to the supporting road bed.

14. The device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road bed according to claim 13, wherein the or each base plate (6) features receptacle devices (11) for the adjusting elements (5) for horizontally adjusting the rail, as well as receptacle devices (8) for the adjusting elements (7) for vertically adjusting the rail.

15. The device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road bed according to claim 12, wherein the or each adjusting element for vertically adjusting the rail is realized in the form of a spindle rod (7) that is non-positively and/or positively connected to the supporting road bed.

16. The device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road bed according to claim 15, wherein the or each adjusting element for vertically adjusting the rail is supported on the supporting road bed by means of a device for preventing a lateral drift caused by the rotation of the spindle rod (7).

17. The device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road

bed according to claim 12, wherein the or each tiltable connecting element (3) is realized in the form of an arced support beam.

18. The device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road bed according to claim 17, wherein the support beam is supported in a fork-shaped recess of the slide (4).

19. The device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road bed according to claim 12, wherein the or each fixing element (2) is able to carry out a free relative movement between the rail and the fixing element in the longitudinal rail direction.

20. The device for adjusting the position of a rail or a track unit comprising at least one rail relative to a supporting road bed according to claim 12, wherein the or each fixing element (2) is realized in the form of a rail plate that encompasses the base of the rail (1) in a form-fitted fashion.

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