(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 305 984 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
11.04.2018 Bulletin 2018/15

(51) Int Cl.:
E01B 1/00 *(2006.01)* ***E01B 29/40*** *(2006.01)*

(21) Application number: **17191473.2**

(22) Date of filing: **15.09.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **05.10.2016 IT 201600100058**

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(54) **DEVICE FOR POSITIONING RAILS**

(57) A device (1) for positioning rails on a bedplate (10) comprises a body (9), to which the following are applied: abutment means, adapted to enable the bedplate (10) to support the body (9), first supporting means (2p), adapted to enable the body (9) to support a first rail (100p), and second supporting means (2s), adapted to enable the body (9) to support a second rail (100s), wherein the device (1) further comprises adjusting means adapted to adjust the position and/or tilt of the first rail (100p) with respect to the second rail (100s) and/or of the first rail (100p) with respect to the body (9) and/or of the second rail (100s) with respect to the body (9) and/or of the first rail (100p) with respect to the bedplate (10) and/or of the second rail (100s) with respect to the bedplate (10).

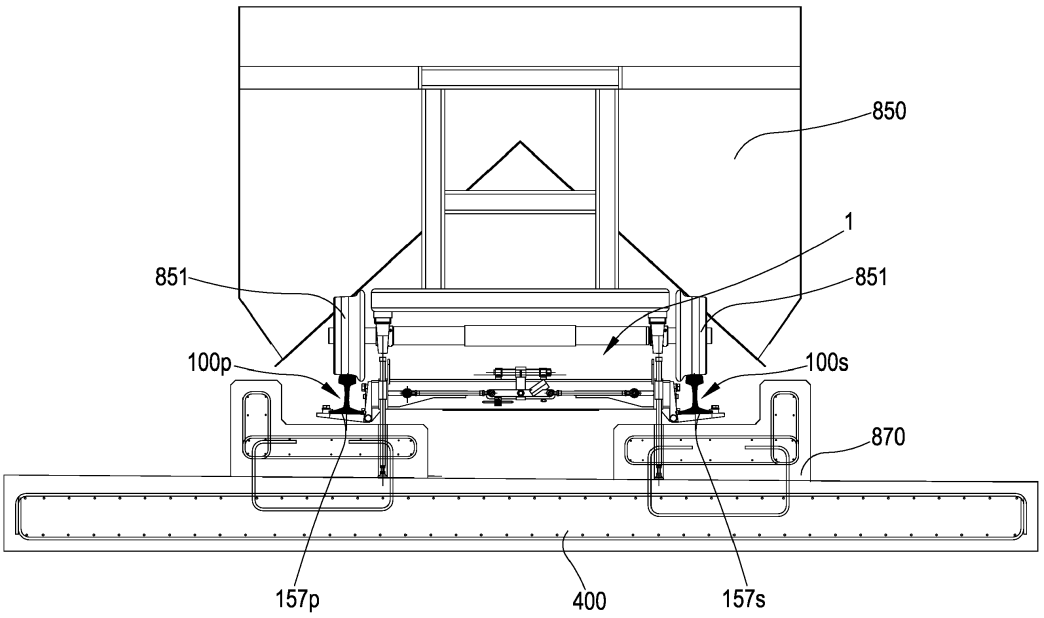

FIG.9

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Description

FIELD OF INVENTION

[0001] The object of the present invention is a device configured for enabling the support and correct positioning of rails on a bedplate, such device being advantageously usable as alignment template for the tracks during construction works of railway infrastructure, such as subway lines, tram lines and train lines. In particular, the device allows the precise and simple adjustment at least of the gauge, of the angle, as well as of the longitudinal and transverse level and of the track with respect to the laying axis.

STATE OF THE ART

[0002] The railway lines of classic type provide for the laying of a track on ballast, i.e. on a gravel cushion that generally has trapezoidal section and function of absorbing the stresses (e.g. the weight of the tracks and of the vehicles that transit thereon). In the ballast, the crosspieces are embedded and maintained in position, such crosspieces connecting the two rails of a track. Railway lines with ballast have a strong need for maintenance, especially ridging and profiling in order to renew the desired geometry. In order to overcome such disadvantage (and the consequent repercussions on the maintenance costs of the railway lines of classic type), railway lines have been developed in which the laying of a track occurs without the use of ballast. These new lines, with concrete bed, with respect to those of classic type have benefits not only from the maintenance standpoint but also regarding bulk (hence they are particularly adapted for tramways and subways), stress resistance (hence they are particularly adapted for high-speed lines) and minimization of the vibroacoustic disturbances. In a track without ballast, the rails are arranged directly on the upper surface of a continuous concrete slab.

[0003] The construction of a railway line without ballast typically provides for the execution of a series of steps that involve significant critical issues. First, the rails are laid on the ground by means of a suitable roller system. Then, the transverse and longitudinal positions of the rails are adjusted, aligning the track and fixing the laying angle of the rails. The rails are then locked by means of suitable supports applied separately to each rail of the track. Finally, the concrete is cast. From that described above, it is inferred that the typical construction of a railway line without ballast involves considerable difficulties in bringing the rails to the nominal operating heights. In addition, it must be observed that the abovementioned adjustments typically vary as a function of the track portion under construction, particularly in the presence of curves or change of level of the laying plane. Therefore, there is also the need to progressively modify and adapt the abovementioned positioning of the rails and of the track. In addition to the inconvenient positioning and aligning of the rails, the use of single supports for the rails makes the final casting of the concrete extremely difficult, since maximum attention must be given in order to avoid any movement of the rails during the casting. All this negatively impacts the track laying speed and consequently the attainment costs of railway infrastructure.

[0004] Also known from the patent WO 2013030723 A1 is a system for aligning and lifting rails for the construction of systems termed "slab track", i.e. with superstructure without ballast. The device described in such patent comprises a support for each rail that is vertically adjustable. The support bears an adjust-and-lock rail system capable of enabling the adjustment of the angle of the rail and within small intervals the distance of the rail from the track axis. A rail-locking element is then coupled to the adjust-and-lock rail system in order to stop the track in the desired position and a transverse bar of preestablished size is then coupled to two opposite rail-locking elements in order to make the entire alignment system integral. The above-described system, while providing an improved aid for adjusting and laying tracks, nevertheless still appears affected by many of the drawbacks encountered in the prior art. In fact, the adjustment operations are still limited and not very intuitive; moreover, the system requires steps for laying, adjusting and final assembly before the cement casting. Finally, many of the parts are hard to remove at the end of the laying.

OBJECT OF THE INVENTION

[0005] Object of the present invention is to resolve all of the above-lamented critical issues in relation to the typical construction of a railway line with the cement bed.

[0006] Another object of the present invention is to facilitate the arranging of the rails of a track at the nominal operating heights, eliminating the inconvenience in positioning and aligning the rails.

[0007] Another object of the present invention is to considerably reduce the complexity of execution of the final concrete casting.

[0008] Another object of the present invention is to increase the track laying speed and consequently considerably reduce the overall costs for attaining railway infrastructure.

[0009] One object of the finding is also to enable the simple extraction of the entire device once the cement casting has been carried out and the possibility of an immediate reuse of the device itself which also maintains the already-set adjustments, so as be already suitably pre-adjusted for carrying out the laying of the line.

[0010] In addition, the device, object of the present description, enables the passage on the track, during laying, of a dispenser capable of carrying out the cement casting.

[0011] These and further objects are attained by means of the device for positioning rails on a bedplate according to the present invention.

[0012] The idea underlying the present invention is that of using a multipurpose single template for the simulta-

neous laying of both rails of a track, first enabling the adjusting of the position and tilt of every single rail of the track and then enabling the support of the track such to allow service trolleys to travel thereon before the final concrete casting. Advantageously, it is intended to make such single template in the form of a removable, portable and easily transportable instrument. Once the final concrete casting has been carried out, it is in fact desired that the single template be retracted from the track, in order to then be used at a different installation site.

[0013] In addition, once the template has been extracted it maintains the pre-adjustments, including in particular the angle of the rail and the gauge and it can be immediately reused for the construction of the same line.

[0014] By way of a non-limiting example, the description is now reported of a preferred embodiment of a device according to the present invention for positioning rails on a bedplate.

[0015] The following description, in addition to detailing the characteristics of the device, also clearly elucidates the various adjustments of the position and of the tilt made possible by the device according to the present invention and the operations of a track laying process in which a device according to the present invention is used.

SUMMARY

[0016] The aspects of the invention are described in the following. In a 1st aspect, it is provided a device (1) for supporting and positioning track on a bedplate (10), said device comprising:

- a body (9);
- abutment means applied to said body (9) and adapted to enable said bedplate (10) to support said body (9);
- first supporting means (2p) applied to said body (9) and adapted to enable said body (9) to support a first rail (100p);
- second supporting means (2s) applied to said body (9) and adapted to enable said body (9) to support a second rail (100s); and
- adjusting means adapted to adjust at least one or more among:

    a) the position and/or tilt of said first rail (100p) with respect to said second rail (100s),
    b) the position and/or tilt of said first rail (100p) with respect to said body (9),
    c) the position and/or tilt of said second rail (100s) with respect to said body (9),
    d) the position and/or tilt of said first rail (100p) with respect to said bedplate (10),
    e) the position and/or tilt of said second rail (100s) with respect to said bedplate (10),

said body (9) and said first and/or second supporting means (2p; 2s) being movable with respect to each other at least between:

- an extracted supporting position wherein said first and/or second supporting means (2p; 2s) enable respectively supporting the first and/or second rail (100p; 100s), and
- a retracted removal position wherein said first and/or second supporting means (2p; 2s) are retracted with respect to the extracted supporting position and configured to allow removal the device (1) from the track.

[0017] In a 2nd aspect, it is provided a process for positioning a track using a device for supporting and positioning track on a bedplate (10) according to the preceding aspect, optionally using a device for supporting and positioning track on a bedplate according to any one of the enclosed claims.

[0018] In a 3rd aspect, it is provided a process for positioning a track using a device (1) using a device for supporting and positioning track on a bedplate according to any one of the enclosed claims, said process comprising at least the following steps:

- positioning the device (1) on a basement,
- arrange the first and the second supporting means (2p, 2s) in the extracted supporting position,
- positioning the first rail on the first support means (2p),
- positioning the second rail on the second support means (2s),
- casting of the concrete under the first and the second supporting means (2p, 2s) so that said cast concrete supports, directly or indirectly, said first and second rails.

[0019] In a 4th aspect according to the preceding aspect the process comprises an extraction step of said device from the cast of concrete.

[0020] In a 5th aspect according to aspect 3rd or 4th the process comprises at least a position and/or tilt adjustment step of at least of between said first and second rail.

[0021] In a 6th aspect according to the preceding step the adjustment step comprises at least one between the following sub-step:

- adjusting the position and/or tilt of said first rail (100p) with respect to said second rail (100s),
- adjusting the position and/or tilt of said first rail (100p) with respect to said body (9),
- adjusting the position and/or tilt of said second rail (100s) with respect to said body (9),
- adjusting the position and/or tilt of said first rail (100p) with respect to said bedplate (10),
- adjusting the position and/or tilt of said second rail (100s) with respect to said bedplate (10).

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Some embodiments and some aspects of the invention will be described in the following with reference to the attached drawings, given only in an indicative and therefore non-limiting way, wherein:

- figure 1 represents an axonometric view of a device according to the present invention;
- figure 2 represents a section view of a device according to the present invention, the device being sectioned by a plane orthogonal to the rails;
- figures 3 to 5 represent detailed views, axonometric or sectional, of the device according to the present invention;
- figures 6 to 15 show operations included in the process of track laying by means of the device according to the present invention and
- figures 16 and 17 show the device according to the present invention as seen frontally, in order to underline the operation of the device retraction means,
- figures 18 to 25 show the device according to the present invention as seen frontally, in order to underline the operation of the device adjusting means.

DETAILED DESCRIPTION

[0023] Figures 1 and 2 show a device 1 for positioning rails on a bedplate 10, which implements the teachings of the present invention.

[0024] The device 1 comprises a body 9, such body 9 having the role of structural element adapted for supporting and connecting functional elements of the device 1. Such body 9 can conveniently appear in the form of a longitudinal element made by means of an entirely hollow metal section (with rectangular or square section). The length of such body 9 is sized based on the gauge of the track to be laid: since such gauge is typically equal to 1435 mm, the length of the body 9 can be comprised between 1200 mm and 1400 mm. Of course any size measure can be employed as a function of the requirements and gauge of the track under construction. Indeed, the extension direction x of the body 9, during the laying of a track, is substantially orthogonal to the extension direction of the rails. Advantageously, the body 9 is symmetrical with respect to an imaginary plane K interposed between the rails; the imaginary plane K is represented in figure 1 and preferably includes an imaginary straight line substantially parallel to the rails and equidistant from the two rails.

[0025] Since the device 1 is designed as a removable and transportable device (hence reusable), the body 9 preferably comprises gripping means, adapted to facilitate the operations of lifting and moving of the device 1. In the embodiment represented in Figure 1, the gripping means comprise a first handle 5a and a second handle 5b arranged in proximity to the two ends of the body 9. The gripping means can be welded to the body 9, or they can be constrained thereto in a different manner (e.g. hinged to the body 9). Finally, the gripping means can have overturned U-shaped form, or another form capable of ensuring comfortable gripping. Typically, two people transport the device in a rather easy manner, since the overall weight thereof is about 60 Kg.

[0026] Abutment means are applied to the body 9, such means supporting the body 9 on the bedplate 10, maintaining it at a suitable height with respect to the bedplate 10. The abutment means comprise one or more uprights 7 which are extended along a direction substantially orthogonal to the extension direction x of the body 9. Each upright 7 is received in a corresponding seat 92 made in the body 9 in a manner such that upright 7 can translate in such seat 92 so to be able to adjust the height of the body 9 with respect to the bedplate 10. Preferably both the upright 7 and the seat 92 have axisymmetric shape. Advantageously, the upright 7 and the seat 92 can be cylindrical, coaxial and both threaded, such that one obtains a translation of the upright 7 in the seat 92 (and hence a variation of height of the body 9 with respect to the bedplate 10), rotating the head 800 of the upright 7 so as to screw or unscrew the upright 7. The diameter of the upright 7 is capable of ensuring an adequate resistance to axial loads, while the length of the upright 7 can be comprised between 300 mm and 750 mm. It is observed that each of the four uprights 7 (two per side) can be separately adjusted, both to account for possible level variations of the abutment surface, and to differentiate the heights of each abutment point if necessary.

[0027] The abutment means comprise a foot 6 for each upright 7 for the abutment of the upright 7 against the bedplate 10. In addition, as is clearly visible in the detail of figure 5, these comprise a joint 70 interposed between each upright 7 and the corresponding foot 6. The joint 70 connects the foot 6 to the upright 7, allowing the first however to be able to rotate around the axis of the upright 7. In such a manner, the stability of the abutment of the body 9 against the bedplate 10 is improved, since possible planarity defects of the bedplate 10 are compensated for by means of the joint 70. Still for ensuring a stable abutment of the body 9 against bedplate 10, the seats for housing the uprights are made on the body 9 in a symmetric manner with respect to the aforesaid imaginary plane K. In the embodiment represented in Figure 1, the abutment means comprise four uprights. Accordingly, the body 9 comprises four seats, each of which arranged in proximity to a corner of the body 9.

[0028] The device 1 comprises supporting means adapted to enable the body 9 to support a pair of opposite rails. Therefore, first supporting means 2p for supporting a first rail 100p and second supporting means 2s for supporting a second rail 100s are applied to the body 9. The body 9 and the supporting means are advantageously shaped in a manner such that the extension direction x of the body 9 is substantially orthogonal both to the first rail 100p and to the second rail 100s.

[0029] According to the present invention, the device

1 further comprises adjusting means (detailed hereinbelow) generally adapted to adjust the position and/or tilt of the first rail 100p with respect to the second rail 100s and/or of the first rail 100p with respect to the body 9 and/or of the second rail 100s with respect to the body 9 and/or of the first rail 100p with respect to the bedplate 10 and/or of the second rail 100s with respect to the bedplate 10.

[0030] Since the device 1 is designed as a device that can be extracted from the rails without the position and/or tilt of the rails being modified with respect to the bedplate 10, the device 1 preferably comprises retraction means adapted to bring the first supporting means 2p and the second supporting means 2s into relative positions with respect to the body 9 such that the first rail 100p and the second rail 100s are no longer supported by the device 1 and do not interfere with the removal of the device 1 from the site of installation.

[0031] In order to optimize the number of components of the device 1, the device 1 can be advantageously attained such that predetermined elements are shared among the abutment means and the adjusting means and/or among the adjusting means and the retraction means and/or among the retraction means and the abutment means.

[0032] The first supporting means 2p are now described in detail, with reference in particular to Figures 1 to 3 and specifying that the characteristics of the first supporting means 2p can also conveniently be attributed to the second supporting means 2s.

[0033] The first supporting means 2p comprise a portion connecting to said body 9 and a portion supporting the first rail 100p. The connecting portion is configured in a manner such that it can slide with respect to the body 9 along the extension direction x (orthogonal to the axis of the track), so to be able to reduce/increase the distance of the first rail 100p from the body 9 or so to be able to determine the retraction of the supporting portion from the first rail 100p. Therefore the connecting portion comprises a core 21 in shape coupling with the terminal part of the body 9 directed towards the first rail 100p. When the body 9 is made by means of an internally hollow metal section (e.g. with rectangular or square section), the core 21 of the connecting portion can advantageously also be made by means of an internally hollow metal section (with the same section as the body 9 and slightly smaller size, based on the thickness of the metal section that forms the body 9).

[0034] The core 21 is rigidly connected to a bracket 22. The core 21 and the bracket 22 (being rigidly connected to each other, e.g. by means of welding) actually form a single block. The surface of the bracket 22 can extend beyond the surface of the transverse section of the body 9 (e.g. it can be extended in the direction of the bedplate 10): in such case, the body 9 provides for one or more slits (e.g. made in the lower face at the end part) adapted to prevent the body 9 from interfering with the sliding of the bracket 22, typically during the retraction of the supporting portion. Advantageously, the bracket 22 is substantially C-shaped, such that it has a first flange 22a and a second flange 22b that are externally extended, exiting from the body 21, along a direction substantially parallel to the extension direction x of the body 9.

[0035] The supporting portion can comprise a bottom plate 24 against which the first rail 100p abuts and a lateral plate 23, adjacent to the bracket 22 of the connecting portion. The bottom plate 24 and the lateral plate 23 are advantageously made by means of a single L-shaped piece.

[0036] In order to rigidly connect the first rail 100p to the supporting portion of the first supporting means, the device 1 advantageously comprises blocking means 20 removably applicable to the supporting portion. As clearly shown in Figure 2, in the bottom plate 24 of the supporting portion a through hole 124 is made in which a bolt 25 of the blocking means 20 is housed. Such bolt 25 maintains in position an insert 26, a first locking tooth 28 being applied at the surface of such insert 26 directed towards the lateral plate 23. A second locking tooth 29 is instead applied at the external surface of the lateral plate 23, across from the first locking tooth 28 (see figure 1).

[0037] The first rail 100p, and analogously the second rail 100s, from top to bottom, consist of a head 155p, a stem 156p and a bottom 157p. The first locking tooth 28 and the second locking tooth 29 are therefore shaped in a manner such to interfere, by means of the tightening force applied by means of the bolt 25, with the bottom 157p of the first rail 100p, thus retaining the first rail 100p stably in position. In order to unlock the first rail 100p from the supporting portion of the device 1 (e.g. before activating the retraction means), one proceeds by removing the insert 26, once the bolt 25 is disengaged from the bottom plate 23. Advantageously the first supporting means 2p comprise articulation means adapted to enable the supporting portion to rotate with respect to the connecting portion according to an axis h substantially orthogonal to the body 9 and preferably parallel to the bedplate 10. In one possible embodiment of the device 1 according to the present invention, such articulation means comprise a pin or grub screw 50 and a bolt 51, which acts as an adjusting bolt. The pin 50 crosses through holes that are substantially coaxial with each other and obtained, in order, in the first flange 22a, in the supporting portion and in the second flange 22b, allowing the supporting portion to rotate around the axis h. The bolt 51 instead constrains the lateral plate 24 to the bracket 22, thus limiting the amplitude of the possible rotation of the supporting portion around the axis h. Under the effect of the weight of the bottom plate 23 and of the first rail 100p, the lateral plate 24 tends to be separated from the bracket 22 up to the maximum level allowed by the bolt 51. Therefore, by tightening or loosening the bolt 51, it is possible to adjust the tilt of the stem 156p of the first rail 100p with respect to the bedplate 10 and therefore one can vary the laying angle of the first rail 100p.

[0038] As an alternative to the just-described technical

solution, it can be provided that the pin which enables the rotation around the axis h is interposed between the bottom plate 23 and the lateral plate 24, in which case the bottom plate 23 is constantly maintained adjacent to the bracket 22, the bolt 51 acting as fixing bolt, and no longer as adjusting bolt. This adjustment enables modifying the laying angle of the rail in a manner such that the same can assume the provided design angle, for example it can be at 0°, 1/40, 1/20, though of course it can assume any necessary design angle. It should be observed that once the angle of the rail has been adjusted by means of the abovementioned adjusting means, such angle is also maintained when the first and the second supporting means 2p, 2s are retracted in order to extract the device and hence the same is repositioned and the supporting means 2p, 2s newly extracted in order to continue laying the track.

[0039] In other words, quite advantageously, the pre-adjustment of the laying angle, which generally will not vary during the construction of uniform sections of the line (e.g. along a rectilinear section), is maintained and it is no longer necessary to operate this delicate adjustment in the subsequent steps.

[0040] A first pin 121p is rigidly applied to the connecting portion of the first supporting means 2p. As clearly seen in the detail of figure 3 (which represents a view of the device 1 from which the body 9 has been removed), the application of the first pin 121p to the connecting portion occurs by means of a plate 102 fit inside slits made in the walls of the connecting portion, preferably in the lateral walls of the connecting portion. The plate 102 renders the coupling between the connecting portion and the first pin 121p extremely strong, given that the connecting portion, the plate 102 and the first pin 121p actually form a single plate.

[0041] The body 9 comprises a first groove 90p arranged along the extension direction x, the first groove 90p preferably being made in the lateral walls of the body 9. The first pin 121p can slide along the first groove 90p, the position of the first pin 121p inside the first groove 90p being relative to the position assumed by the supporting portion with respect to the body 9. The length of the first groove 90p is such to enable the supporting portion to assume the retracted position and hence to eliminate any possible interference with the first rail 100p. The first pin 121p is thus pivoted to the first element 8p, whose function will be explained hereinbelow, together with that of the connecting mechanism 8 with which it operates.

[0042] Advantageously, the ends of the device 1 have mirrored shape. Therefore, that described above in relation to the structure of the first supporting means 2p and to their interfacing both with the body 9 and with the first rail 100p is also applicable to the structure of the second supporting means 2s and to the interfacing of the latter both with the body 9 and with the second rail 100s. The application of the blocking means 20 to the supporting portion of the second supporting means 2s for removably constraining the second rail 100s to the second supporting means 2s analogously occurs at the application of the blocking means 20 described above with reference to the first supporting means 2p and to the first rail 100p. Finally the body 9 comprises a second groove 90s (advantageously symmetrical with respect to the first groove 90p, with symmetry plane substantially coinciding with the aforesaid imaginary plane K) which is arranged along the extension direction x of the body 9 and in which a second pin 121s can slide which is applied to the connecting portion of the second supporting means 2s and to which a second element 8s is pivoted, which operates with the connecting mechanism 8 together with the first element 8p.

[0043] The connecting mechanism 8 is shared between the adjusting means and the retraction means, and through this both the position of the first supporting means 2p and that of the second supporting means 2s can be adjusted with respect to the body 9, and the retraction of the first supporting means 2p and of the second supporting means 2s can be actuated. Nevertheless, it is observed that quite advantageously the operation of the retraction means does not affect the pre-adjustment given to the adjusting means, which is maintained. In addition to the first element 8p and to the second element 8s, the connecting mechanism 8 also comprises an intermediate element 8r connected to the first element 8p by means of a third pin 122p and to the second element 8s by means of a fourth pin 122s. The set of the two grooves (first groove 90p and second groove 90s), of the four pins (first pin 121p, third pin 122p, fourth pin 122s and second pin 121s) and of the three elements (first element 8p, intermediate element 8r and second element 8s) creates a kinematic mechanism comprising in series: a first prismatic pair (first pin 121p free to translate with respect to the body 9 in the first groove 90p), a first revolute pair (first element 8p free to rotate with respect to the first pin 121p), a second revolute pair (first element 8p free to rotate with respect to the intermediate element 8r), a third revolute pair (second element 8s free to rotate with respect to the intermediate element 8r), a fourth revolute pair (second element 8s free to rotate with respect to the second pin 121s) and a second prismatic pair (second pin 121s free to translate with respect to the body 9 in the second groove 90s).

[0044] By applying a moment to the intermediate element 8r, the above kinematic mechanism obliges the first pin 121p and the second pin 121s (which are rigidly applied respectively to the connecting portion of the first supporting means 2p and to the connecting portion of the second supporting means 2s) to simultaneously slide respectively in the first groove 90p and in the second groove 90s in opposite directions with respect to each other. Therefore, a moment applied to the intermediate element 8r that tends to move it away from its parallel orientation with respect to the extension direction x simultaneously causes a sliding of the first pin 121p in the first groove 90p and a sliding of the second pin 121s in

the second groove 90s, both sliding events occurring from the periphery towards the center: one thus obtains a mutual approaching between the first supporting means 2p and the second supporting means 2s. On the contrary, a moment applied to the intermediate element 8r that tends to move it closer to its parallel orientation with respect to the extension direction x causes a sliding of the first pin 121p in the first groove 90p and a sliding of the second pin 121s in the second groove 90s that are simultaneous and both from the center towards the periphery: one thus obtains a mutual moving apart of the first supporting means 2p and the second supporting means 2s.

[0045] In order to apply a moment to the intermediate element 8r, in order to move the first supporting means 2p and the second supporting means 2s closer together or further apart, the device 1 according to the present invention advantageously comprises an actuating socket 3 integral with the intermediate element and arranged thereon in an eccentric position (in the example of figure 1, the actuating socket 3 is in fact represented distant from the third pin 122p and close to the fourth pin 122s). The actuating socket 3 is shaped in a manner such to be adapted for receiving an operating member such as a rod. The rod, once inserted, can act as a lever and be manually actuated in order to make the intermediate element 8r rotate with respect to the first element 8p and/or with respect to the second element 8s. Even if the technical solution with actuating socket 3 integral with the intermediate element 8r and removable actuation lever is preferable due to the consequent smaller bulk of the device 1, alternatively one can make the actuation lever fixed and integral with the intermediate element 8r. This movement enables being moved from the extracted configuration of the first and second supporting means 2p, 2s (fig. 1) to the retracted configuration of the first and second supporting means 2p, 2s (fig. 14) and vice versa.

[0046] The device 1 according to the present invention furthermore offers the possibility of generating a translation of the first supporting means 2p (and consequently of the first rail 100p, when constrained to the first supporting means 2p) with respect to the body 9, without moving the second supporting means 2s (and consequently without moving the first rail 100p, when constrained to the first supporting means 2p). Such translation limited to the first supporting means 2p (and possibly to the first rail 100p) is made possible by the shape of the first element 8p such that it can have adjustable length.

[0047] In particular, the first element 8p comprises two rods coupled together so as to create a prismatic pair. The rods can be two threaded coaxial rods: in accordance with the degree of penetration of the internal rod in the external rod, the length of the first element 8p is determined. Therefore, if it is desired to adjust the position of the first rail 100p in moving away from the body 9, one executes a calibrated variation of the coupling between the two rods of the first element 8p, in order to reduce the penetration of the internal rod in the external rod by a quantity corresponding to the moving away of the first rail 100p that one wishes to obtain. If it is instead desired to adjust the position of the first rail 100p in approaching the body 9, one executes a calibrated variation of the coupling between the two rods of the first element 8p, in order to increase the penetration of the internal rod in the external rod by a quantity corresponding the approaching of the first rail 100p that one wishes to obtain.

[0048] Once the desired length of the first element 8p has been obtained, one advantageously provides for stably locking together the internal rod and external rod by means of one or more nuts. The adjustable length of the first element 8p attains considerable advantages including the possibility to correct, during the laying of the tracks, possible errors in the gauge (i.e. in the distance between the head of the first rail 100p and the head of the second rail 100s).

[0049] Mirroring that provided in relation to the possible translation of the first supporting means 2p (and possibly of the first rail 100p), the device 1 according to the present invention offers the possibility to generate a translation of the second supporting means 2s (and consequently of the second rail 100s, when constrained to the second supporting means 2s) with respect to the body 9, without moving the first supporting means 2p (and consequently without moving the first rail 100p, when constrained to the first supporting means 2p). Such translation limited to the second supporting means 2s (and possibly to the second rail 100s) is made possible by the shape of the second element 8s such that it can have adjustable length. The second element 8s can conveniently be shaped identically to the first element 8p, hence with two rods coupled together so as to create a prismatic pair, preferably with two threaded coaxial rods, so that in accordance with the degree of penetration of the internal rod in the external rod, the length of the second element 8s is determined.

[0050] The use of the bars 8p and/or 8s enables a precise adjustment of the gauge. Once such adjustment is precisely obtained, the same is maintained, also following the steps of retraction and/or extraction of the first and second supporting means 2p, 2s by means of levers 8r.

[0051] This aspect is rather important since none of the sections with identical gauge require any further adjustment in such sense, rendering the subsequent laying operations quicker. The intermediate element 8r advantageously comprises two bars that are substantially parallel to each other. The bars are pivoted to the third pin 122p in a manner such that the fulcrum of the first element 8p on the third pin 122p is interposed between the two bars of the intermediate element 8r and pivoted to the fourth pin 122s in a manner such that the fulcrum of the second element 8s on the fourth pin 122s is interposed between the two bars of the intermediate element 8r. In this manner, the centers of gravity of the first element 8p, of the intermediate element 8r and of the second element

8s are substantially aligned with each other, thus avoiding significant undesired stresses on the elements and obtaining important benefits relative to the strength of the connecting mechanism 8.

[0052] As is visible also in the detailed view in Figure 4, which represents a view of the device 1 sectioned according to the aforesaid imaginary plane K (and hence orthogonal to the extension direction x of the body 9), advantageously the intermediate element 8r is pivoted to the third pin 122p and to the fourth pin 122s as well as to an intermediate pin 40. The fulcrum of the intermediate element 8r on the intermediate pin 40 is interposed between the fulcrums on the third pin 122p and on the fourth pin 122s. Advantageously the geometric center of the intermediate pin 40 is substantially equidistant from the geometric center of the third pin 122p and from the geometric center of the fourth pin 122s, and the geometric center of the intermediate pin 40 is substantially aligned with such geometric centers along a straight line substantially parallel to the extension direction x of the body 9.

[0053] The intermediate pin 40 is integral with an arm 4 which, in addition to being connected to the intermediate element 8r by means of the intermediate pin 40, is also constrained to slide along an intermediate groove 91 made on the body 9. Therefore, an intermediate revolute pair (intermediate element 8r free to rotate with respect to the arm 4) and an intermediate prismatic pair (arm 4 free to translate with respect to the body 9 in the intermediate groove 91) thus come to be formed. Advantageously the intermediate groove 91 is interposed between the first groove 90p and the second groove 90s. Advantageously the geometric center of the intermediate groove 91 is substantially equidistant from the geometric center of the first groove 90p and from the geometric center of the second groove 90s, and the geometric center of the intermediate groove 91 is substantially aligned with such geometric centers, along a straight line substantially parallel to the extension direction x of the body 9.

[0054] Preferably the first groove 90p, the intermediate groove 91 and the second groove 90s are obtained together in succession on a lateral wall of the body 9. Consequently, the first element 8p, the intermediate element 8r and the second element 8s are arranged in lateral position with respect to the body 9.

[0055] The application, in order, of the intermediate revolute pair and of the intermediate prismatic pair to the connecting mechanism 8 affects the kinematic mechanism of the connecting mechanism 8. Indeed the intermediate revolute pair obliges the point of the intermediate element 8r pivoted to the intermediate pin 40 to maintain its height during any rotation of the intermediate element 8r. Therefore, by applying a moment to the intermediate element 8r (e.g. by means of the actuating socket 3), the consequent rotation of the intermediate element 8r has the intermediate pin 40 as center.

[0056] The intermediate prismatic pair instead allows translating the entire connecting mechanism 8 by means of a translation of the arm 4. In such a manner, by adjusting the position of the arm 4 with respect to the body 9, the positions of the first supporting means 2p (and consequently of the first rail 100p, when constrained to the first supporting means 2p) and of the second supporting means 2s (and consequently of the second rail 100s, when constrained to the second supporting means 2s) are adjusted with respect to the body 9. The adjustment enabled by the intermediate prismatic pair is such that, if the translation of the arm 4 is able to vary the position of the first supporting means 2p by moving them further away from the body 9 by a specific quantity, simultaneously the position is modified of the second supporting means 2s, which are moved closer to the body 9 by the same quantity. If instead the translation of the arm 4 is able to vary the position of the first supporting means 2p by moving them closer to the body 9 by a specific quantity, simultaneously the position is modified of the second supporting means 2s, which are moved away from the body 9 by the same quantity.

[0057] This movement enables, by maintaining the gauge between the rails unchanged, centering the track where - due to the positioning of the device - the supports 2p and 2s are not already aligned with the laying direction of the respective rail.

[0058] In order to enable the arm 4 to translate with respect to the body 9 along a direction substantially parallel to the extension direction x, suitable horizontal adjusting means are applied to the body 9. Advantageously the arm 4 has substantially L-shaped extension and such horizontal adjusting means are applied to the upper surface of the body 9. According to the embodiment of the present invention represented for example in Figures 1, 2 and 4, the horizontal adjusting means comprise a threaded member 170, integral with an adjustment head 171 and maintained in a fixed position with respect to the body 4 by means of a first support 172a and a second support 172b. The two supports 172, preferably arranged at the ends of the threaded member 170, preferably symmetrical to each other according to the aforesaid imaginary plane K and preferably screwed to the upper surface of the body 9, each comprise a housing substantially coaxial with the threaded member 170.

[0059] In order to be able to translate with respect to the threaded member 170 (and consequently with respect to the body 9), the arm 4 integrally comprises a threaded eyelet 177, substantially coaxial with the threaded member 170 and whose thread is compatible with that of the threaded member 170. Therefore, by rotating the adjustment head 171, the arm 4 is moved along the threaded member 170 and consequently both the first supporting means 2p and the second supporting means 2s are translated with respect to the body 9.

[0060] Advantageously the vertical adjusting means make use of the above-described abutment means. The height of the body 9 with respect to the bedplate 10 can in fact be adjusted by using the heads 800 of the uprights

7 in order to move the uprights 7 in their housing seats 92 integral with the body 9.

[0061] By employing the configuration of the abutment means represented in Figures 1 and 2, in which there are four uprights 7 arranged in proximity to the corners of the body 9, one can make the same adjustment on each head 800, or the adjustments made on the heads 800 adjacent to the first supporting means 2p can differ from the adjustments made on the heads 800 adjacent to the second supporting means 2s. Since in such final case the relative vertical position of the first supporting means 2p is varied with respect to the second supporting means 2s, possible height differences can be resolved between the first rail 100p and the second rail 100s, due for example due a planarity defect of the bedplate 10.

[0062] Figures 16 to 25 summarize the adjustments possible in the above-described device 1. Each adjustment is represented in a pair of images, the difference between the first image and the second image of each pair underlining the effect that each adjustment is able to produce on the device 1. In each image, are graphically underlined the elements that contribute to the adjustment to each the image refers.

[0063] Figures 16 and 17 illustrate the simultaneous retraction (and a subsequent extraction) of the first supporting means 2p and of the second supporting means 2s, suitable for removing the device 1 from its installation site (and hence bringing the device 1 back into its operating configuration). Retraction and extraction are obtained by means of the connecting device 8, advantageously in combination with an operating member inserted in the actuating socket 3.

[0064] Figures 18 and 19 illustrate the fine adjustment of the vertical position of the body 9 and consequently of the first supporting means 2p and of the second supporting means 2s.

[0065] Such adjustment is obtained by intervening on the abutment means, in particular on the elements of the abutment means which enable the adjustment thereof (i. e. on the head 800 and on the thread of the upright 7 and of the seat 92). This is aimed for positioning the track at the correct height with respect to the bedplate 10. In addition, as previously explained, with a selective intervention on the abutment means (in which the abutment means are differently adjusted with respect to each other) one can compensate for possible planarity defects of the bedplate 10 which prevent an optimal laying of the track.

[0066] Figures 22 and 23 illustrate the fine adjustment of the transverse distance between the first supporting means 2p and the second supporting means 2s (fine adjustment of the gauge). Such adjustment is obtained by autonomously intervening on the length of the first element 8p and/or on the length of the second element 8s. This is aimed to correct possible defects in the transverse positioning of the first rail 100p and/or of the second rail 100s, thus also resolving imperfections in the gauge of the track.

[0067] Figures 20 and 21 illustrate the fine adjustment of the linked transverse position of the first supporting means 2p and of the second supporting means 2s. Such adjustment is obtained by intervening on the adjustment head 171 in order to translate, by means of the threaded member 170, the arm 4 (and the entire connecting mechanism 8 therewith). The aim of this is to position the track at the correct transverse level.

[0068] Figures 24 and 25 illustrate the fine adjustment of the angular position of the supporting portion of the first supporting means 2p (and/or of the second supporting means 2s) with respect to the connecting portion of the first supporting means 2p (and/or of the second supporting means 2s). Such adjustment is obtained by intervening on the above-described articulation means, by means of which it is possible to rotate the supporting portion with respect to the connecting portion. The aim of this is to position the first rail 100p and/or the second rail 100s with the correct laying angle.

[0069] It is important to once again underline that the various adjustments executable are totally independent from each other, in the sense that each can (if necessary) be separately carried out with at all impacting the other adjustments, which therefore are maintained. In other words, once the gauge and the angle of the track are adjusted, if one acts on the centering of the track (element 170) neither the gauge nor the laying angle of any of the rails are modified, and vice versa.

[0070] The adjustments are also 'non-sensitive' regarding the steps of retraction and/or extraction of the first and second supporting means 2p, 2s. In other words, the execution of the movements illustrated in figures 16 and 17 do not at all alter the adjustments of gauge, movement of the track with respect to the laying axis, longitudinal level and transversal level. The same are maintained, unless there is a new intervention on the respective adjustments.

[0071] This is especially significant in relation to the gauge and to the angle of the rail since typically, at least for uniform line sections, these adjustments do not change and hence - once the pre-adjustments have been made - they are maintained unchanged with extreme advantage regarding the laying speed and in preventing any error of additional adjustment.

[0072] Figures 6 to 15 detail a method for installing a track that makes use of the device 1 for positioning the rails (first rail 100p and second rail 100s).

[0073] The first step of the method (represented in Figure 6) consists of arranging, on the bedplate 10, a plurality of devices 1 aligned as much as possible along that which will be the direction of the track. A suitable spacing is employed (e.g. 5 meters) between one device 1 and the next. Each device 1 is adjusted to the nominal operating height of the track. Figure 6 represents one from among the devices 1, in which the abutment means are adjusted to the nominal operating height of the track and in which the first supporting means 2p and the second supporting means 2s are both situated in the extracted condition with respect to the body 9. The lower part of the abutment

means (hence the terminal part of the upright 7, the joint 70 and the foot 6) is covered by a tube 300, preferably made of rubber or plastic, which has the aim of allowing the extraction of the device 1 from the site of installation once the concrete casting has been carried out. The coupling between the abutment means and the tube 300 is such to allow the abutment means to be extracted from the tube 300 by means of a translational movement and to simultaneously prevent the concrete from penetrating between the abutment means and the tube 300.

[0074] Then, one proceeds with setting the first rail 100p on the first supporting means 2p and the second rail 100s on the second supporting means 2s of the devices 1. The rails will be fixed to the first supporting means 2p and to the second supporting means 2s by means of the application of the bolts 25 and inserts 26. Through means for adjusting the devices 1, the position and/or tilt (relative and/or absolute) of the first rail 100p and the second rail 100s are thus adjusted. This operation is of course only carried out if necessary, since, for example, the laying angle of the track does not change for uniform sections and therefore the adjustment of the device typically only occurs with its first use. Abutment platforms 900 are applied in succession on the rails, which will form the supports for the rails themselves once the installation of the track will have terminated. Clasps 909 are associated with the abutment platforms 900, which will be adapted to constrain the rails to the abutment platforms 900, allowing the removal thereof for maintenance or replacement operations, and pins 903 are also associated with such abutment platforms 900, which will be adapted to ensure the anchorage of the abutment platforms 900 once the support structure of the tracks has been completed. It is then provided to set a steel reinforcement 400 on the bedplate 10. The just-described steps are represented in Figures 7 and 8, respectively by means of a front view and by means of a plan view.

[0075] Figure 9 then represents a decisive step in the installation of the track: the casting of the concrete which will come to form the support structure of the tracks together with the reinforcement 400. Such casting step is very much facilitated by the fact that the temporary structure constituted by the first rail 100p, by the second rail 100s and by the plurality of the devices 1 which support the rails is strong, to the point of enabling the transit on the track of rotatable material (such as service trolleys for overall weights up to about 7 tons). Therefore, for the concrete casting, one can use a dispenser 850 whose wheels 851 roll along the first rail 100p and along the second rail 100s (during laying) while concrete is unloaded on the bedplate 10. For such purpose, the concrete mixer trucks that can bring even 10 or more m^3 of concrete are brought to the section under construction by making use of the track already laid with already-hardened cement. From here, part of the concrete (e.g. 1 m^3) is transferred onto the dispenser, which casts it if necessary by moving on the track being laid; the dispenser 850 is refilled by the main truck each time that it is necessary. In order to further speed up the operations, it is possible to arrange two main concrete mixer trucks such that when 10 m^3 of concrete of the first truck are poured out, the second truck is used for refilling the dispenser, and in such a manner any dead time is eliminated.

[0076] By suitably shaping the concrete, such that the reinforcement 400 remains embedded, the slab 870 is obtained. The slab 870 reliably and safely supports the track by means of the abutment platforms 900 (firmly constrained to the slab 870 by means of the anchorage ensured by the pins 903), ensuring the maintenance of the position and of the tilt of the first rail 100p and the second rail 100s even in the presence of significant stresses, for example those that occur during the transit of a high-speed train.

[0077] Figure 10 represents a front view of the railway infrastructure with the slab 870 sectioned immediately upstream of a device 1, while figure 12 represents a front view of the railway infrastructure with the slab 870 sectioned immediately upstream of a pair of abutment platforms 900. Finally, figure 11 is a plan view of such railway infrastructure.

[0078] After the concrete has suitably hardened (such that the slab 870 is capable of stably supporting the track without the aid of the devices 1), one first proceeds with the removal of the bolts 25 and inserts 26 of the devices 1 (as illustrated in Figure 13) and then with the activation (for example by means of a lever inserted in the actuating socket 3) of the retraction means in order to simultaneously bring the first supporting means 2p and the second supporting means 2s of each device 1 into the respective retracted position, in order to ensure that the first rail 100p and the second rail 100s are no longer supported by the devices 1 and do not interfere with the subsequent removal of the devices 1 from the installation site (as illustrated in Figure 14).

[0079] Figure 15 finally represents a plan view of the railway installation once the devices 1 have been removed. It can be observed that both the first rail 2p and the second rail 2s are maintained in position on the slab 870 by means of the clasps 909 of the abutment platforms 900.

[0080] The devices, already pre-adjusted, are ready for use on subsequent sections of the line.

[0081] It should be observed that it is also possible to employ 'hybrid' laying configurations in order to obtain economical savings. Instead of positioning in a series a plurality of devices identical to that described and illustrated, it is possible to make simplified devices, i.e. by making (with identical common pieces) the templates which however do not enable adjusting alignment and gauge (the unnecessary adjustments and components pursuant to elements 177/172, 8s/8p are eliminated). Clearly, the simplified templates (nevertheless identical with regard to the other components for expense reasons) have lower manufacturing and assembly costs and can be used by alternating them with complete templates in the straight line sections.

ADVANTAGES

[0082] From the preceding description and from the enclosed figures, it is clear that the device 1 according to the present invention is capable of resolving the drawbacks that are typically encountered in the construction of a railway line without ballast.

[0083] The device 1 in fact ensures a reliable and comfortable adjustment of the transverse position and of the longitudinal position of the rails, a reliable and comfortable alignment and a reliable and comfortable adjustment of the laying angle of the rails. The rails are thus quickly brought to the nominal operating heights without particular difficulties.

[0084] In addition, the present invention considerably simplifies the step of concrete casting, since dispensers can be used in the form of rotatable material without there being any movement of the rails during casting.

[0085] The device 1 enables the adjustment of the gauge (within the limits allowed by the adjustments), is usable for laying tracks with different gauge (e.g. on curves with low curvature radius in which the gauge is increased with respect to the rectilinear sections of the same line).

[0086] The adjustment of the angle of the rail (and also of the gauge), once defined, is maintained and does not require other interventions of the operator, therefore the calibration is only carried out once.

[0087] The device 1 therefore minimizes the possibility for human errors.

[0088] It is observed that the correct positioning of the track increases the safety of train transit, reducing wear and also noise.

[0089] From that stated above, it is immediately understood that the device 1 according to the present invention considerably increases the laying speed of the tracks and consequently drastically reduces the costs for making railway infrastructure.

[0090] These and further advantages are fully attained by means of a device 1 as defined by the following claims, which represent an integral part of the present description.

Claims

1. Device (1) for supporting and positioning track on a bedplate (10), said device comprising:

- a body (9);
- abutment means applied to said body (9) and adapted to enable said bedplate (10) to support said body (9);
- first supporting means (2p) applied to said body (9) and adapted to enable said body (9) to support a first rail (100p);
- second supporting means (2s) applied to said body (9) and adapted to enable said body (9) to support a second rail (100s);
- adjusting means adapted to adjust at least one or more among:

a) the position and/or tilt of said first rail (100p) with respect to said second rail (100s),
b) the position and/or tilt of said first rail (100p) with respect to said body (9),
c) the position and/or tilt of said second rail (100s) with respect to said body (9),
d) the position and/or tilt of said first rail (100p) with respect to said bedplate (10),
e) the position and/or tilt of said second rail (100s) with respect to said bedplate (10),
characterized by the fact that said body (9) and said first and/or second supporting means (2p; 2s) are movable with respect to each other at least between:

- an extracted supporting position wherein said first and/or second supporting means (2p; 2s) enable respectively supporting the first and/or second rail (100p; 100s), and
- a retracted removal position wherein said first and/or second supporting means (2p; 2s) are retracted with respect to the extracted supporting position and configured to allow removal the device (1) from the track.

2. Device according to the preceding claim, wherein the first and the second supporting means (2p; 2s) - in the retracted removal position - are at a distance from each other less than the distance in the extracted supporting position.

3. Device according to claim 1 or 2, wherein said body (9) has a main extension direction (x), said first and/or second supporting means (2p; 2s) being reversibly movable between the extracted supporting position and the retracted removal position along said main extension direction (x), optionally said main extension direction (x) - in a use condition of the device (1) and therefore of support of the rails - is substantially orthogonal to said first rail (100p) and to said second rail (100s),
Optionally said body (9) being symmetrical with respect to an imaginary vertical plane (K) passing through the center of the body (9), said imaginary plane (K) - in a use condition of the device (1) and therefore of support of the rails - being interposed between said first rail (100p) and said second rail (100s) and substantially parallel to said first rail (100p) and to said second rail (100s).

4. Device according to any one of the preceding claims,

wherein the first supporting means (2p) comprise a portion connecting to said body (9) and a portion supporting said first rail (100p), said connecting portion being configured for being capable of sliding with respect to said body (9) along the extension direction (x) of said body (9), said first supporting means (2p) also comprising articulation means adapted to enable said supporting portion to rotate with respect to said connecting portion according to an axis (h) substantially orthogonal to said body (9).

5. Device according to the preceding claim, wherein said body (9) comprises a first groove (90p) arranged along the extension direction (x) of said body (9), wherein applied to the connecting portion of said first supporting means (2p) is a first pin (121p) slidable along said first groove (90p).

6. Device according to any one of the preceding claims, wherein the second supporting means (2s) comprise a portion connecting to said body (9) and a portion supporting said second rail (100s), said connecting portion of said second supporting means (2s) being configured for being capable of sliding with respect to said body (9) along the extension direction (x) of said body (9), said second supporting means (2s) also comprising articulation means adapted to enable said supporting portion of said second supporting means (2s) to rotate with respect to said connecting portion according to a respective axis substantially orthogonal to said body (9).

7. Device according to the preceding claim, wherein said body (9) comprises a second groove (90s) arranged along the extension direction (x) of said body (9), wherein applied to the connecting portion of said second supporting means (2s) is a second pin (121s) slidable along said second groove (90s).

8. Device according to claim 6 or 7 comprising blocking means (20) removably applicable to the supporting portion of said first supporting means (2p) for constraining said first rail (100p) to said first supporting means (2p) and to the supporting portion of said second supporting means (2s) for constraining said second rail (100s) to said second supporting means (2s).

9. Device according to any one of the preceding claims comprising a connecting mechanism (8) connecting the first supporting means (2p) to the second supporting means (2s), wherein a movement of the first supporting means (2p) transmitted by means of said connecting mechanism (8) causing a corresponding movement of the second supporting means (2s), the connecting mechanism (8) being configured for synchronizing the movement of the first supporting means (2p) and the second supporting means (2s) between the extracted supporting position and the retracted removal position.

10. Device according to any one of claims from 7 to 9, comprising a connecting mechanism (8) between said first pin (121p) and said second pin (121s), wherein said connecting mechanism (8) comprises:

- a first element (8p) connected to said first pin (121p), in particular said first element (8p) having adjustable length;
- a second element (8s) connected to said second pin (121s), in particular said second element (8s) having adjustable length and
- an intermediate element (8r) connected to said first element (8p) by means of a third pin (122p) and to said second element (8s) by means of a fourth pin (122s), optionally the device (1) comprise an actuating socket (3) fixed to said intermediate element (8r) and configured to rotate said intermediate element with respect to said first element (8p) and/or rotate said intermediate element with respect to said second element (8s),

optionally said actuating socket (3) being adapted for receiving an operating member such as a lever, the movement of the actuating socket causing the rotation of said intermediate element with respect to said first element (8p) and/or the rotation of said intermediate element with respect to said second element (8s).

11. Device according to any one of the preceding claims, wherein said body (9) comprises an intermediate groove (91) arranged along the extension direction (x) of said body (9) and an arm (4) slidable along said intermediate groove (91), said arm (4) being kinematically connected to the first supporting means (2p) and to the second supporting means (2s) in order to enable a translation, optionally a rigid translation, of said means (2p, 2s) with respect to the body (9) along a main extension direction (x) of the body (9).

12. Device according to the preceding claim, wherein said intermediate element (8r) is connected to said arm (4) by means of an intermediate pin (40), wherein applied to said body (9) are horizontal adjusting means adapted to enable said arm (4) to translate with respect to said body (9) parallel to the extension direction (x) of said body (9).

13. Device according to any one of the preceding claims, wherein said abutment means comprise at least one upright (7) which is extended along a direction substantially orthogonal to the extension direction (x) of said body (9), wherein said body (9) comprises at least one seat (92) for housing said at least one up-

right (7), said upright (7) and said seat (92) preferably having axisymmetric shape,
optionally said abutment means comprising at least one foot (6) abutting against said bedplate (10), said foot (6) being connected to said upright (7) by means of a joint (70), vertical adjusting means being associated with said abutment means that are adapted to enable said upright (7) to translate in said seat (92),
optionally said abutment means comprise four uprights and wherein said body comprises four seats, each of said four seats being adapted to house a upright and being arranged in proximity to a corner of said body (9), under use conditions of the device in the retracted removal position the first supporting means (2p) and/or the second supporting means (2s) are substantially situated inside the space delimited by the uprights, in the extracted supporting position the first supporting means (2p) and/or the second supporting means (2s) are substantially situated outside the space delimited by the uprights.

14. Device according to any one of the preceding claims, wherein - under use conditions of the device in the retracted removal position - the first supporting means (2p) and/or the second supporting means (2s) are substantially situated in the transverse space of the body (9), optionally the first supporting means (2p) and/or the second supporting means (2s) - under use conditions of the device in the extracted supporting position - are substantially situated outside the space of the body (9).

15. Device according to any one of the preceding claims comprising a movement mechanism interposed between the first supporting means (2p) and the body (9), said movement mechanism enabling a movement of the first supporting means (2p) between the extracted supporting position and the retracted removal position, in particular the movement mechanism also being interposed between the second supporting means (2s) and the body (9), said movement mechanism enabling a movement of the second supporting means (2s) between the extracted supporting position and the retracted removal position.

16. Device according to any one of the preceding claims, configured so that successive variations of the configuration by means of moving between the extracted supporting position and the retracted removal position do not alter - in the extracted supporting position - a pre-adjustment of the adjusting means in relation to one or more among:

a) the position and/or tilt of said first rail (100p) with respect to said second rail (100s),
b) the position and/or tilt of said first rail (100p) with respect to said body (9),
c) the position and/or tilt of said second rail (100s) with respect to said body (9),
d) the position and/or tilt of said first rail (100p) with respect to said bedplate (10),
e) the position and/or tilt of said second rail (100s) with respect to said bedplate (10).

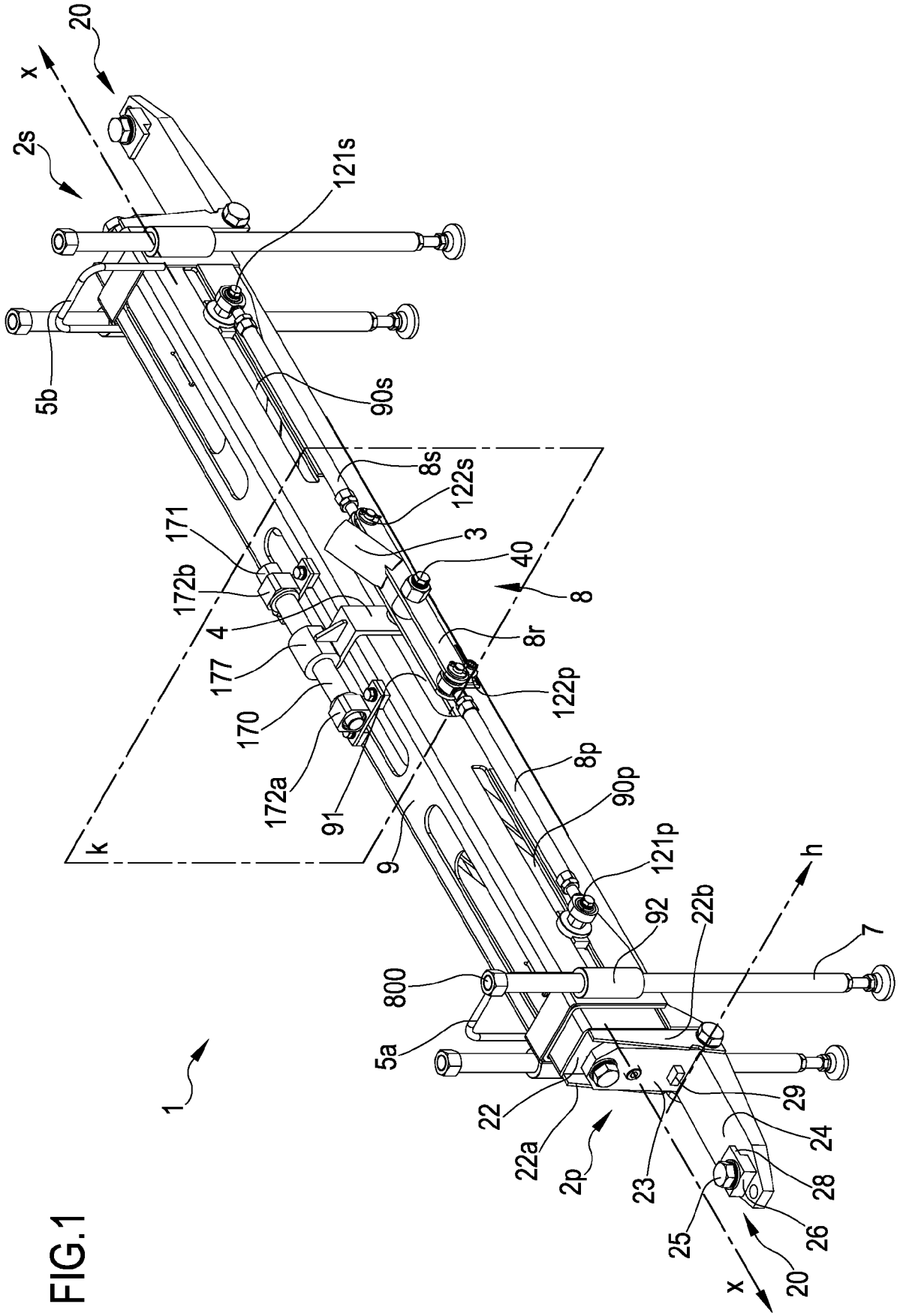
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FIG.1

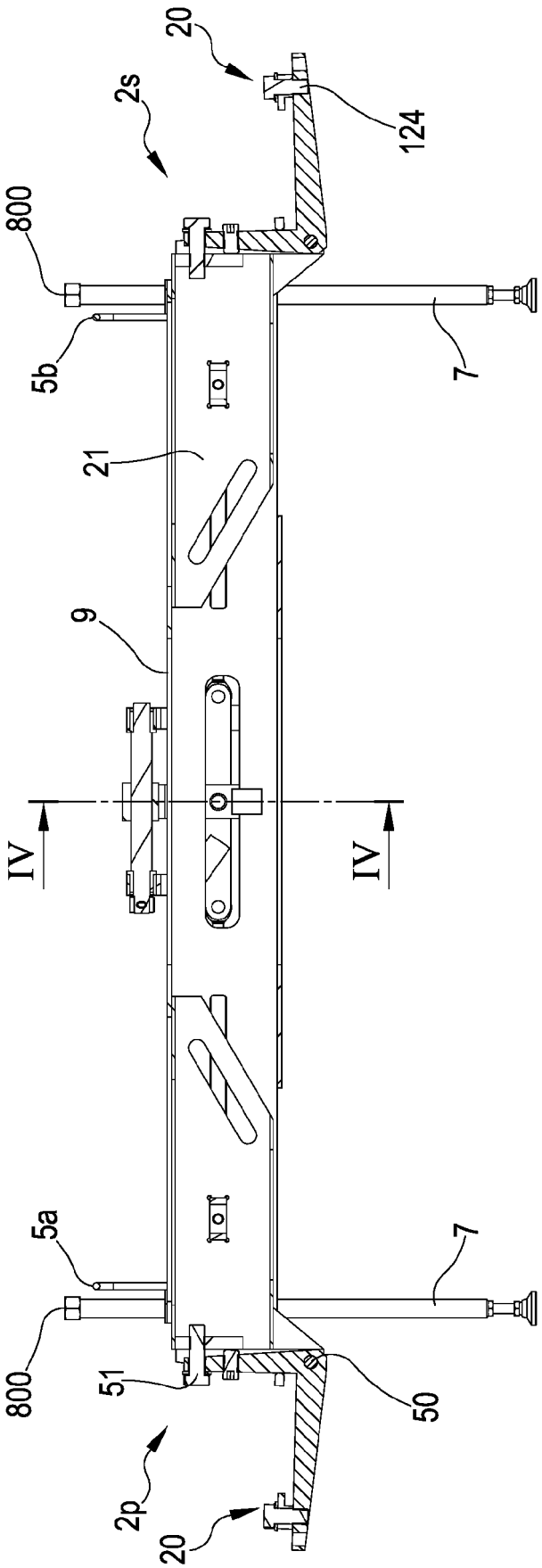
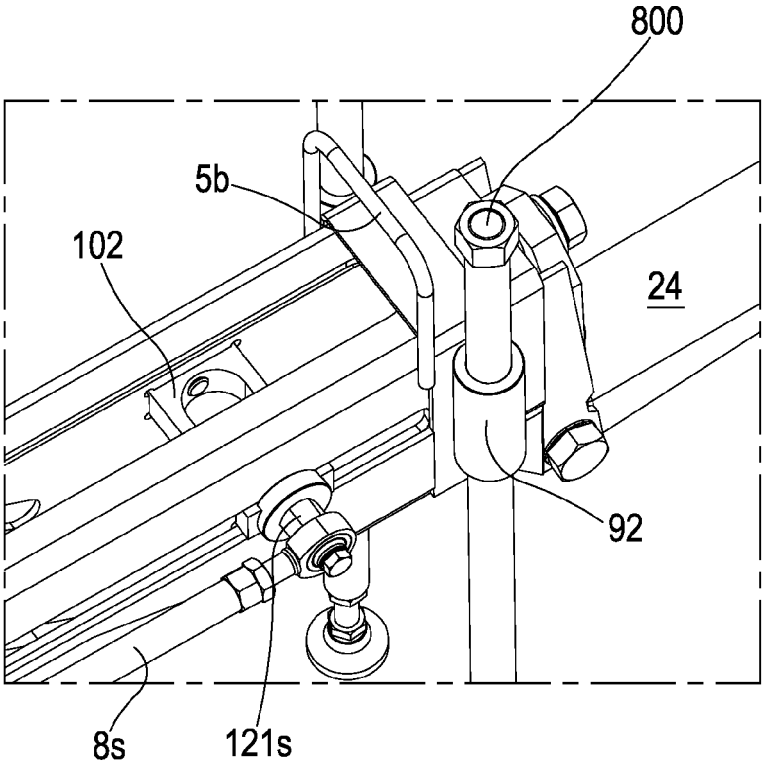


FIG.2

FIG.3



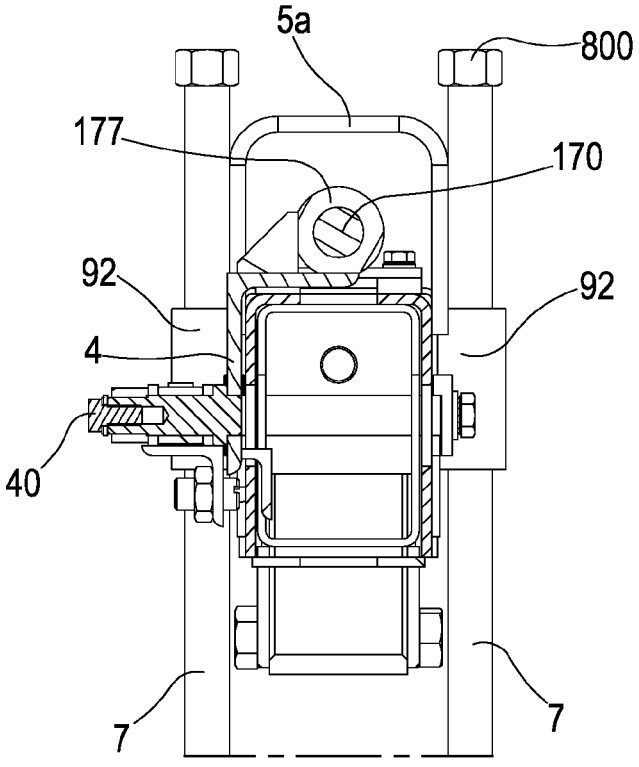


FIG.4

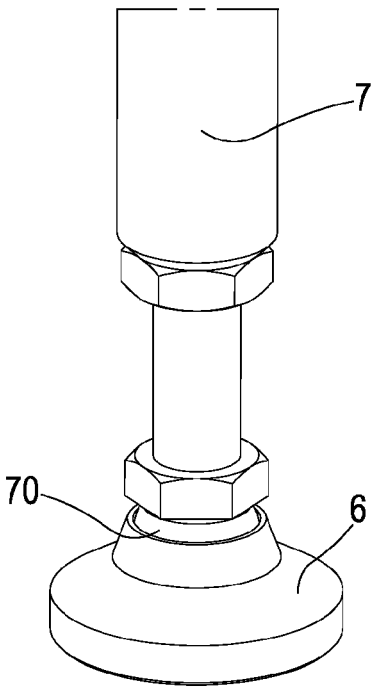
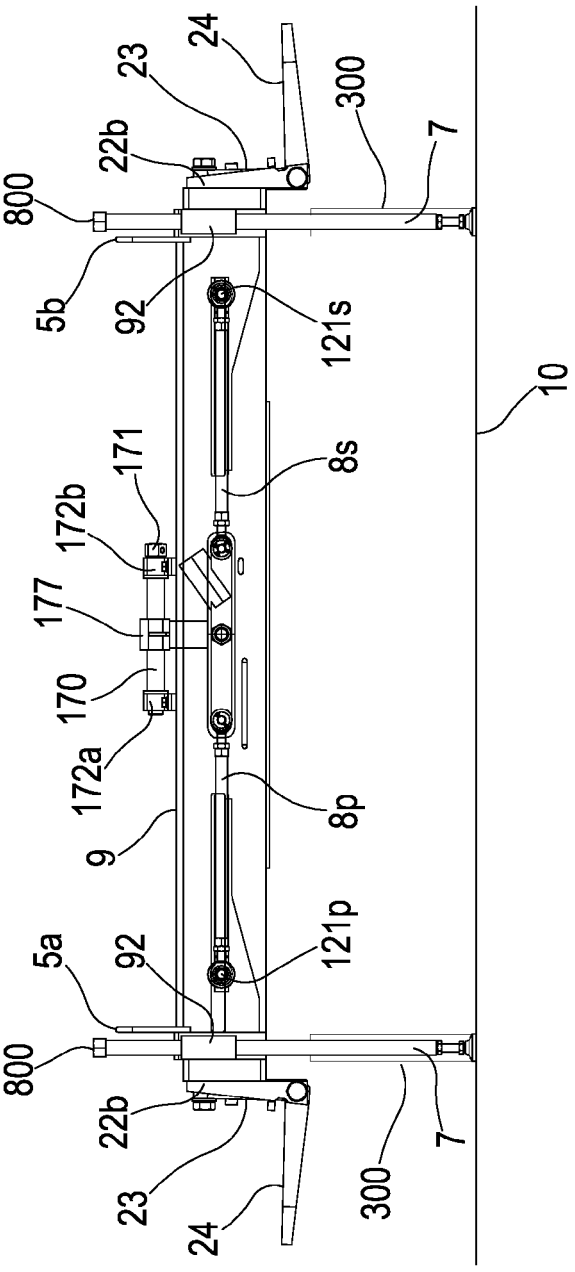


FIG.5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171
8s
172b
177
170
172a
9
8p
121p
5a
92
800
22b
23
24
300
7

FIG.6

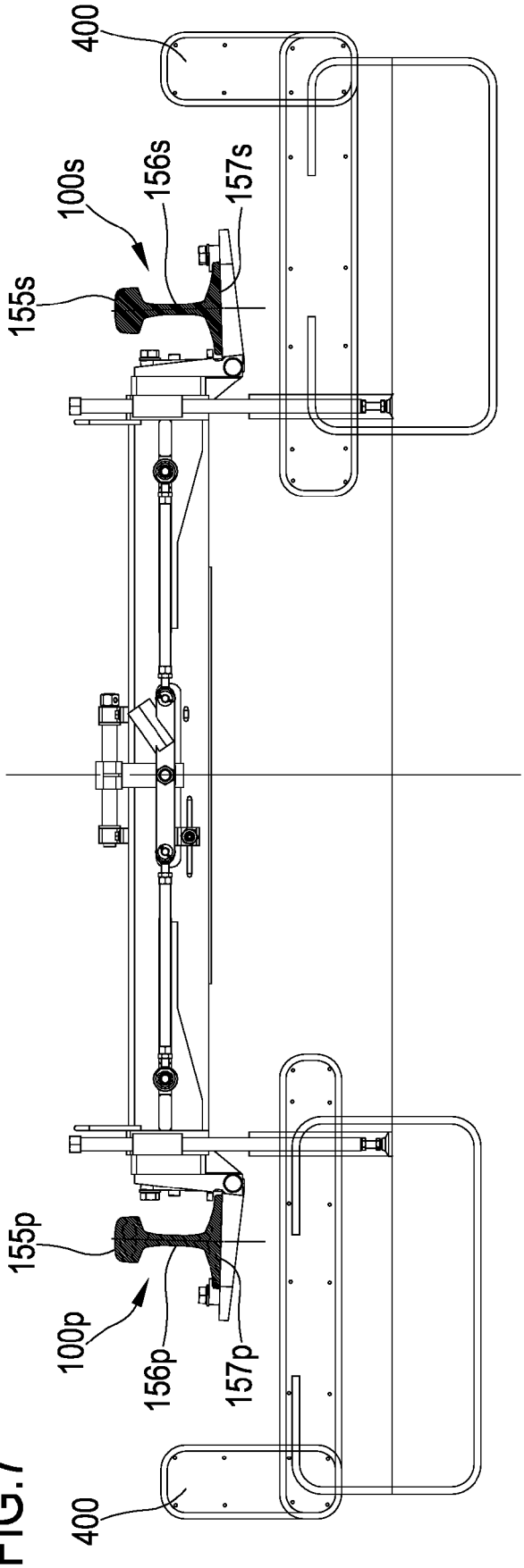

400
100s
156s
157s
155s
155p
100p
156p
157p
400

FIG.7

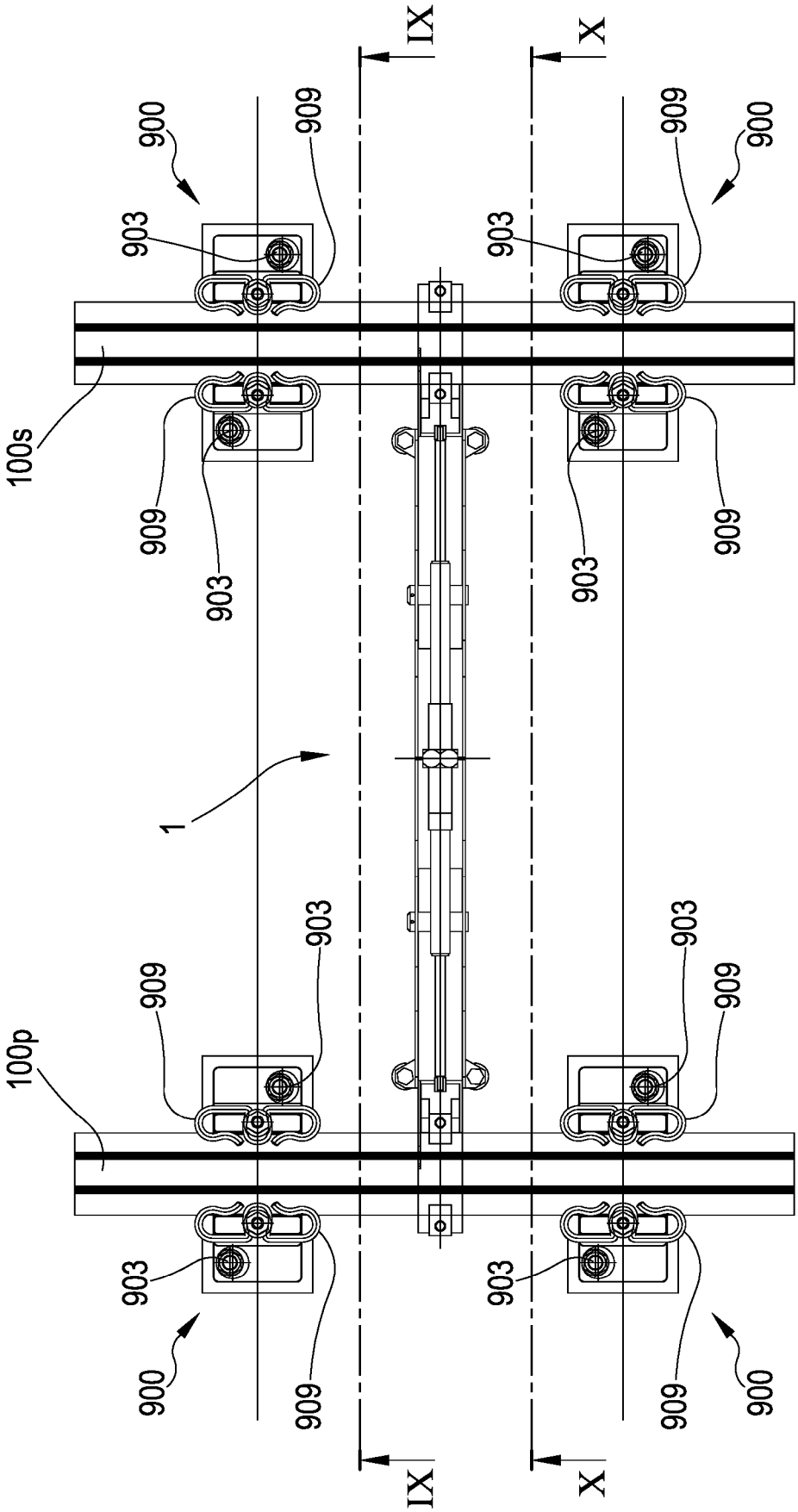


FIG.8

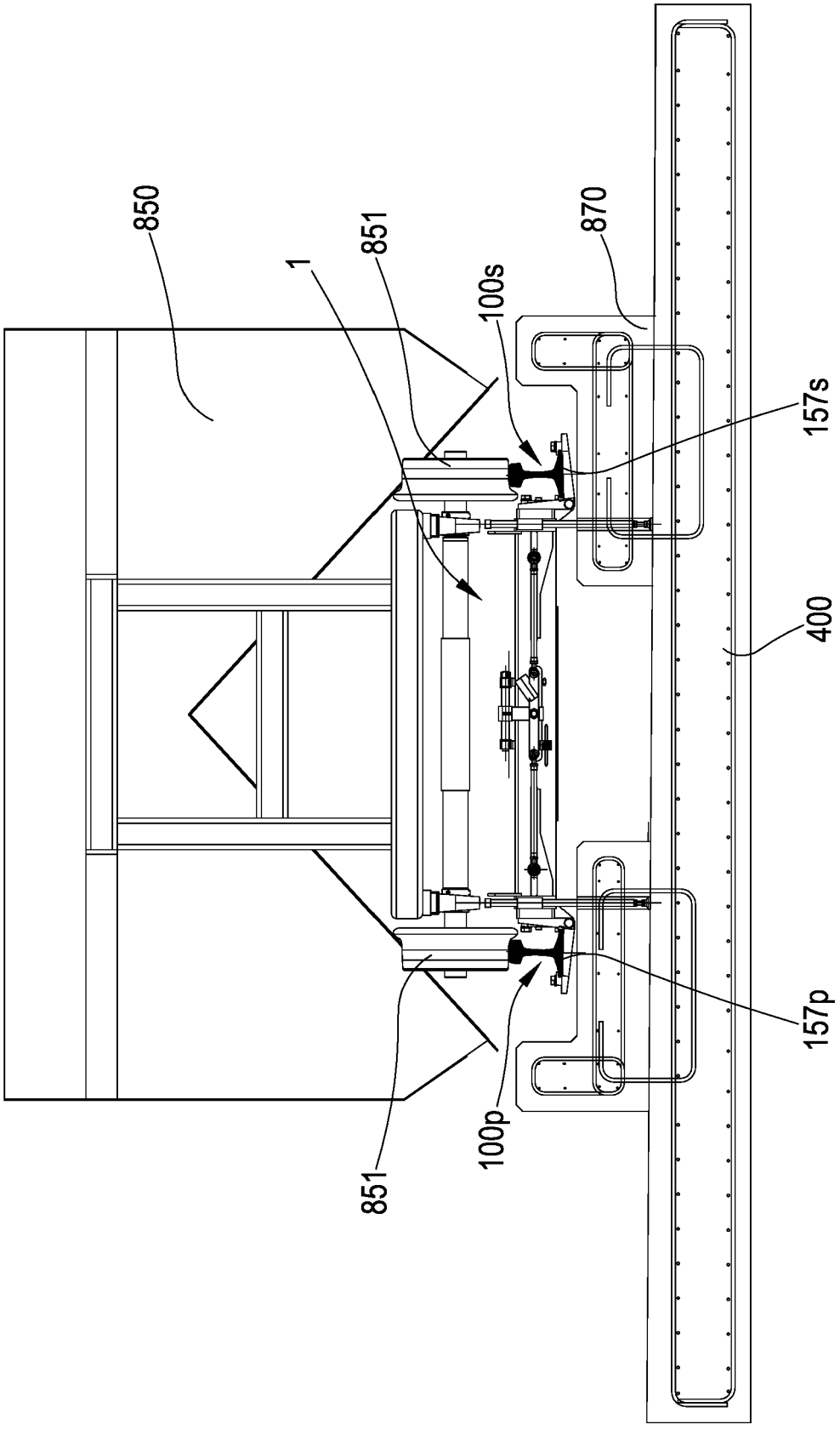


FIG.9

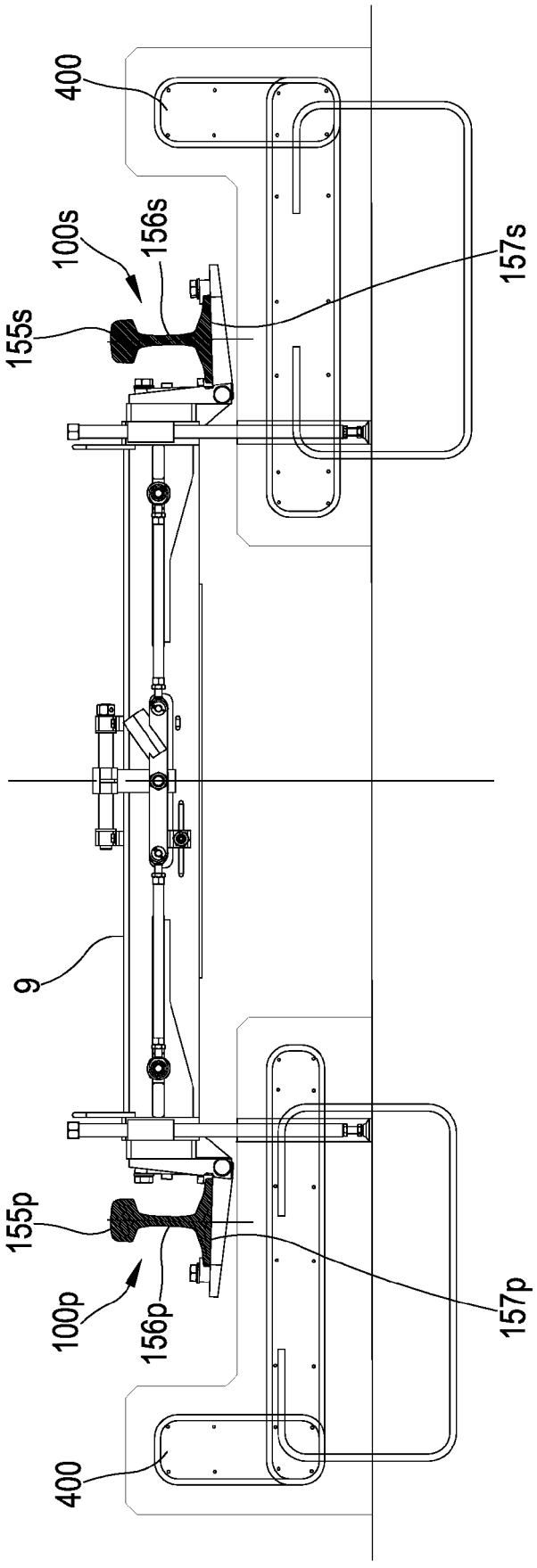


FIG.10

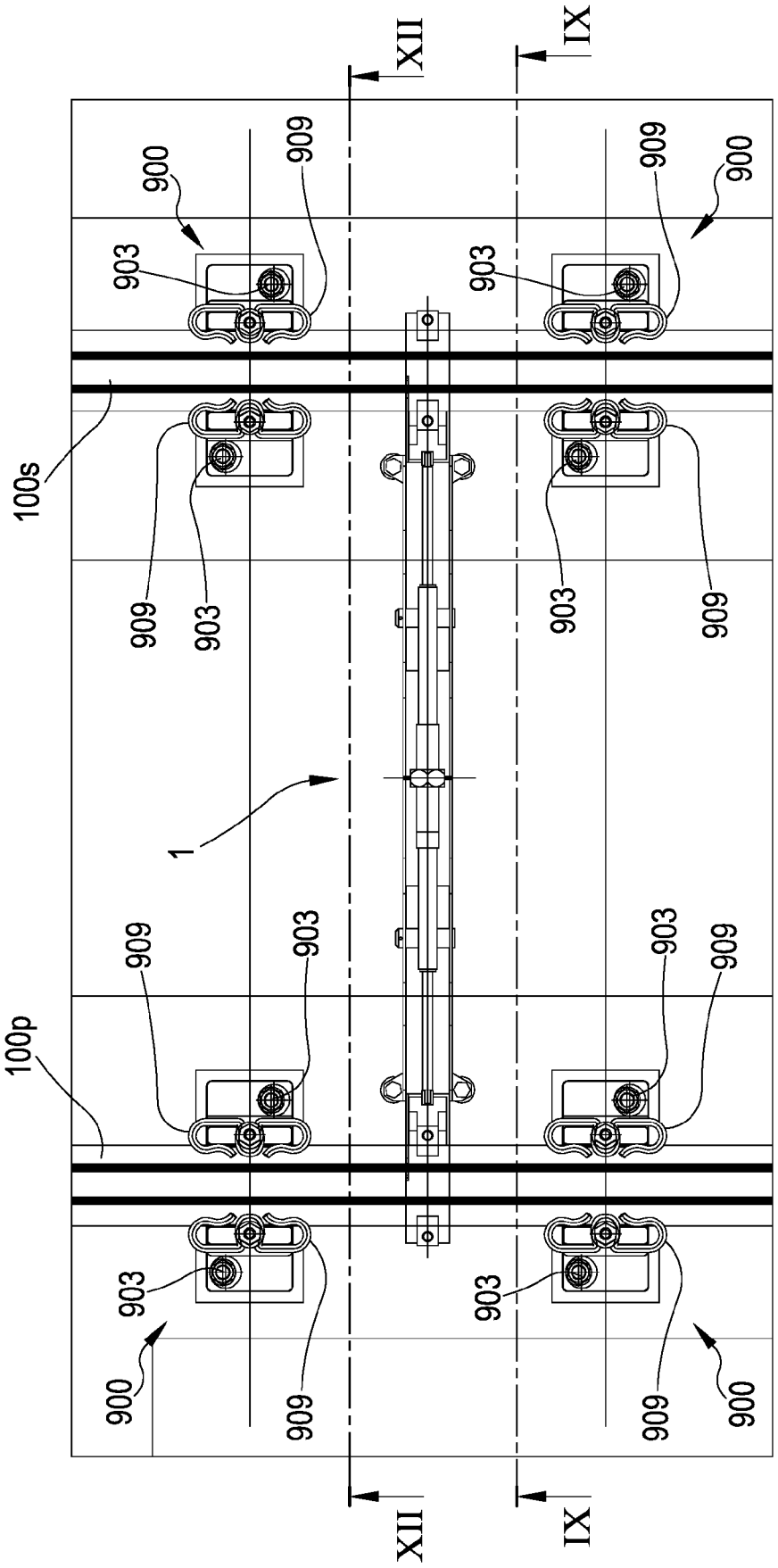


FIG.11

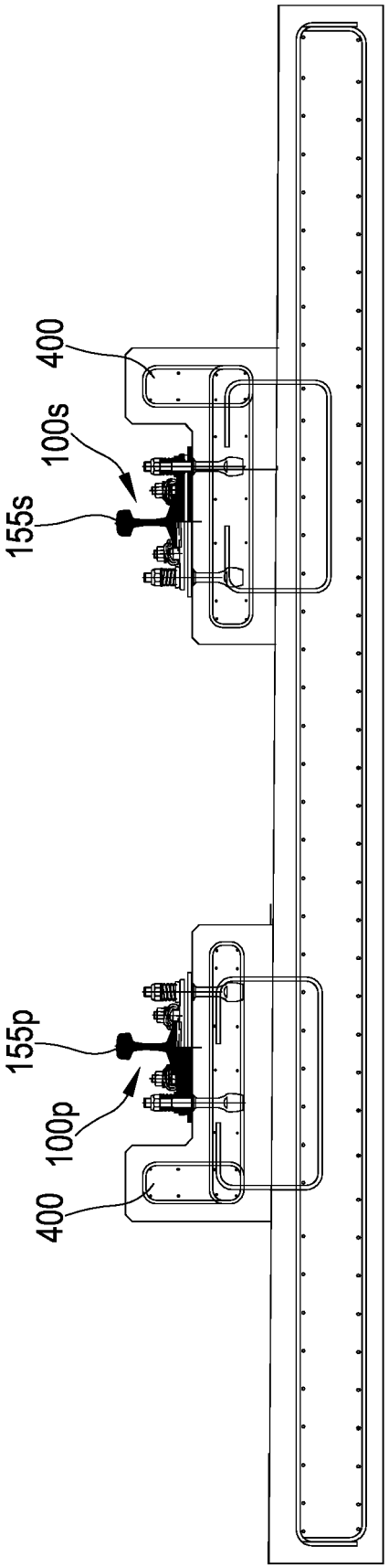


FIG.12

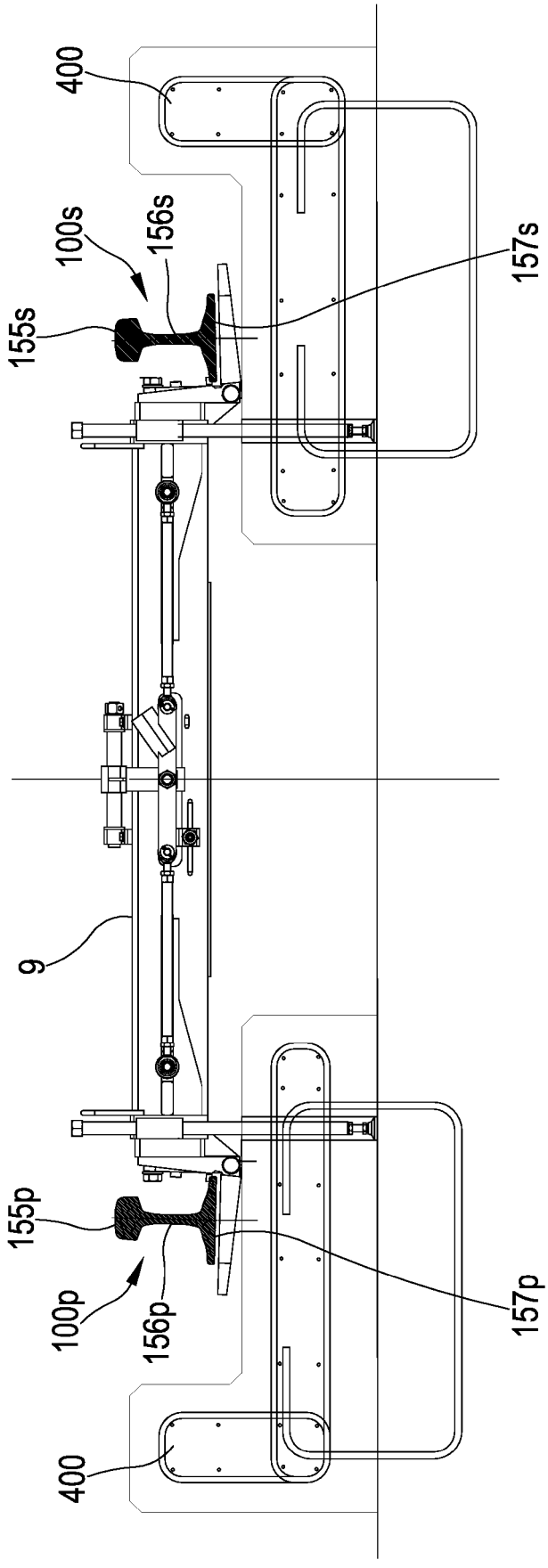


FIG.13

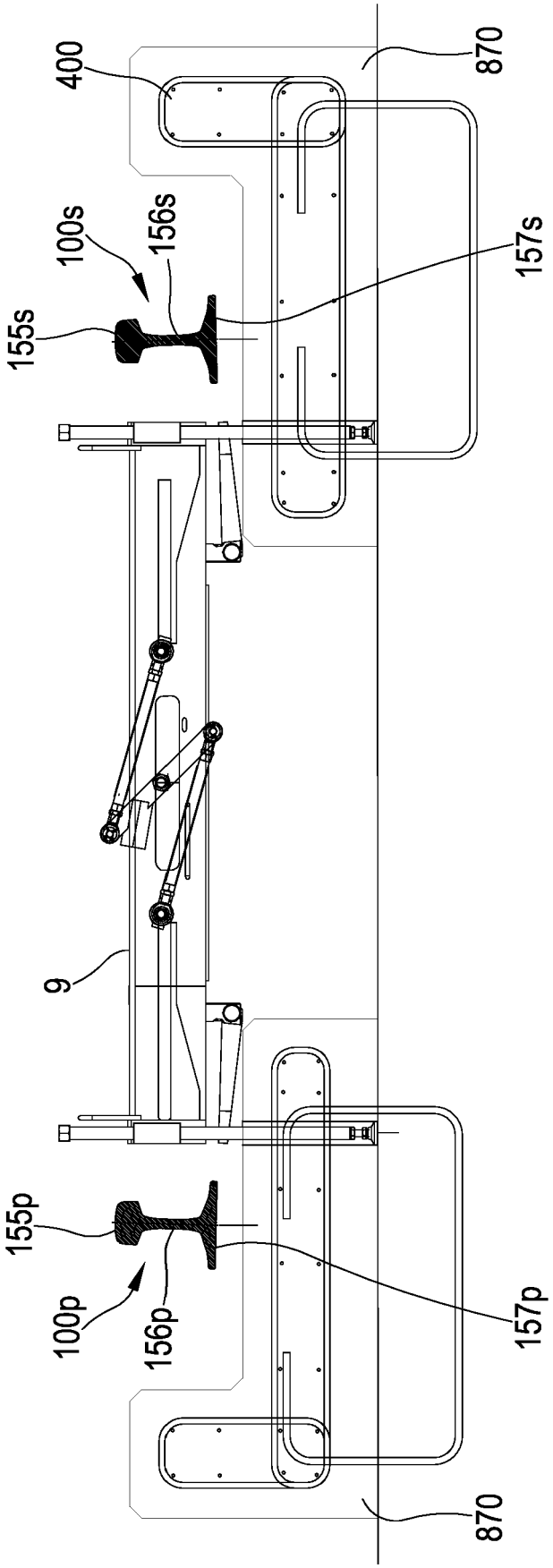


FIG.14

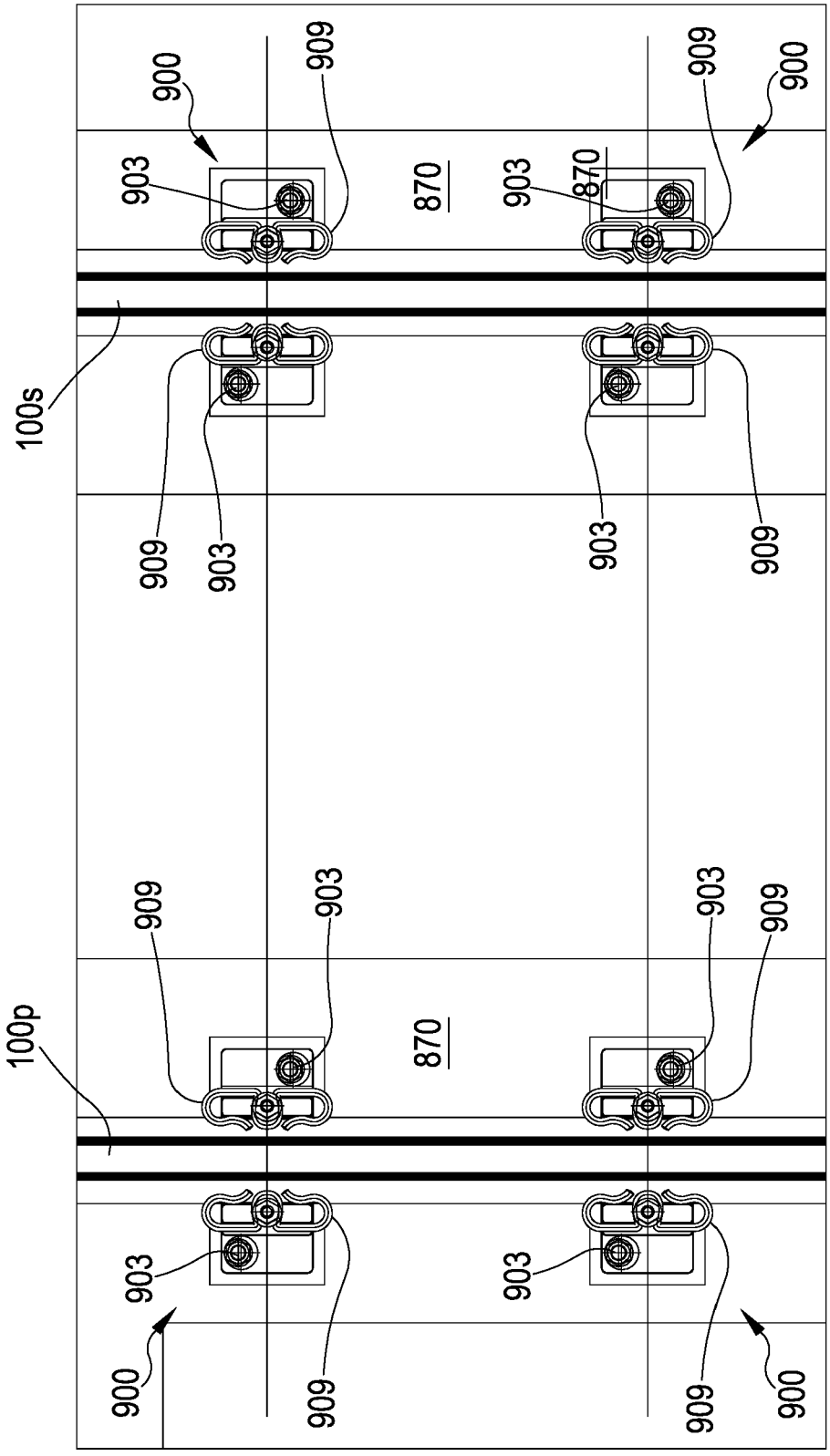


FIG.15

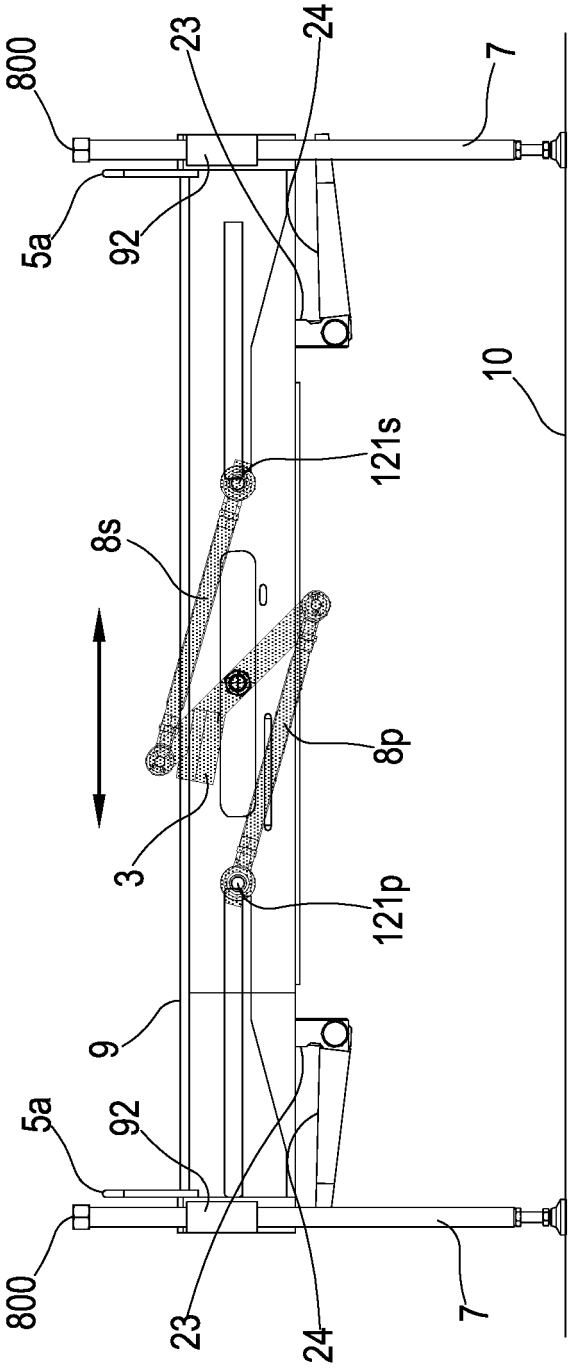
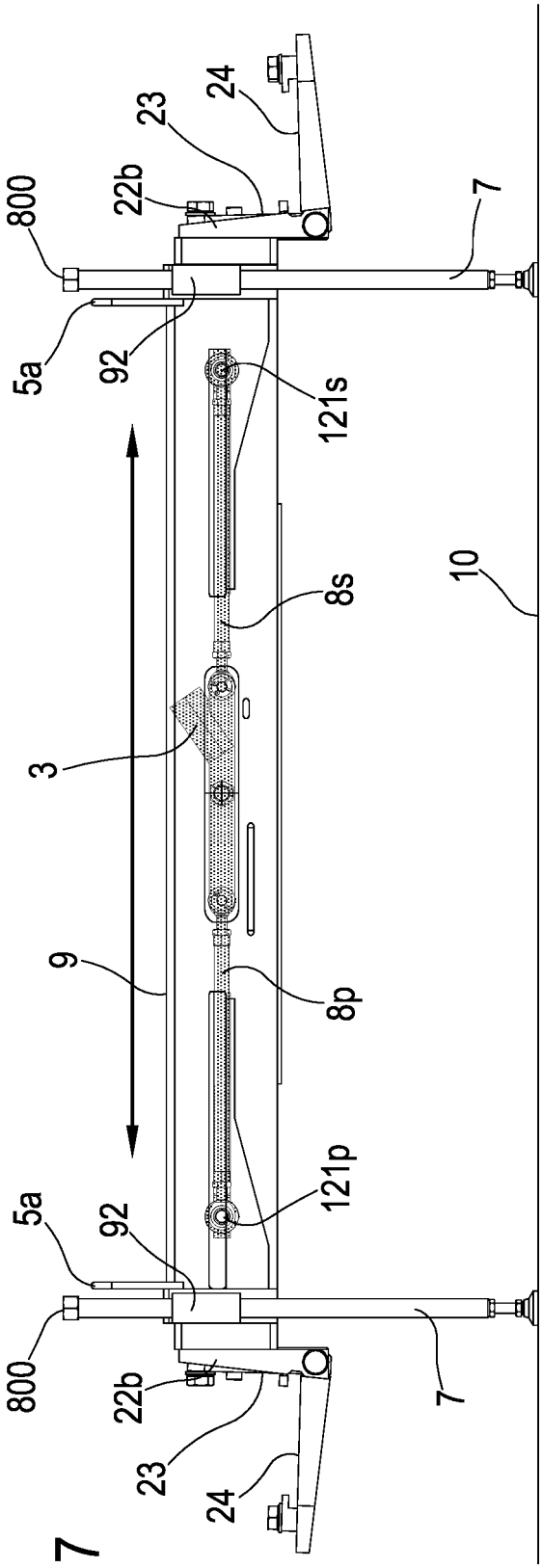

800
5a
92
23
24
7
10
121s
8s
3
8p
121p
9
5a
92
800
23
24
7

FIG.16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5a
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22b
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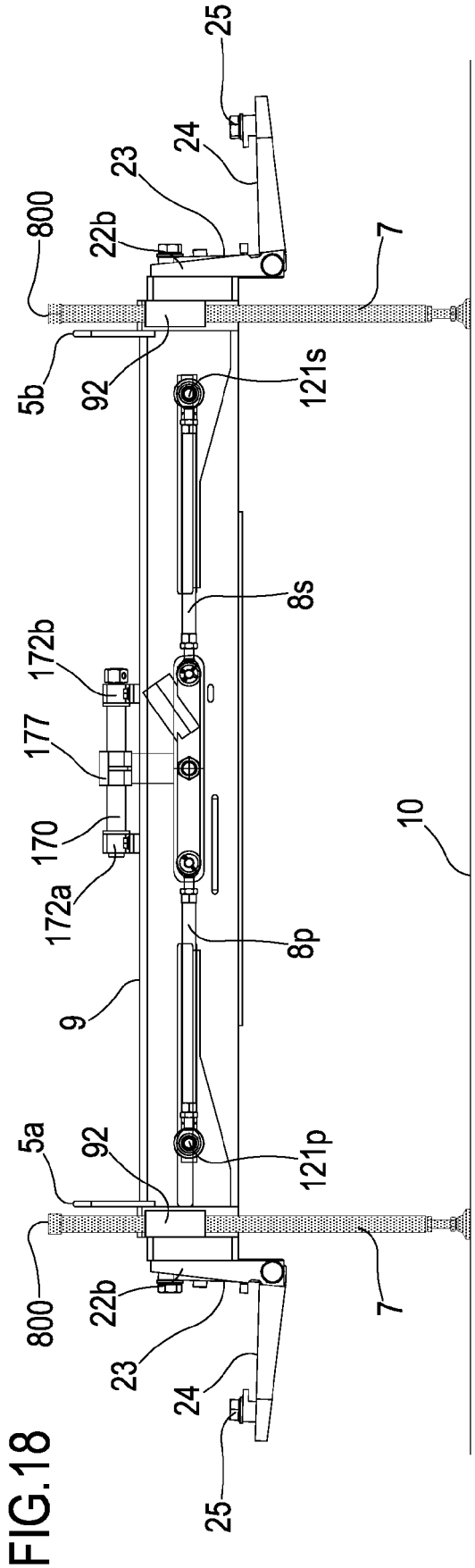
7

FIG.17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121s
8s
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172a
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9
5a
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121p
800
22b
23
24
25
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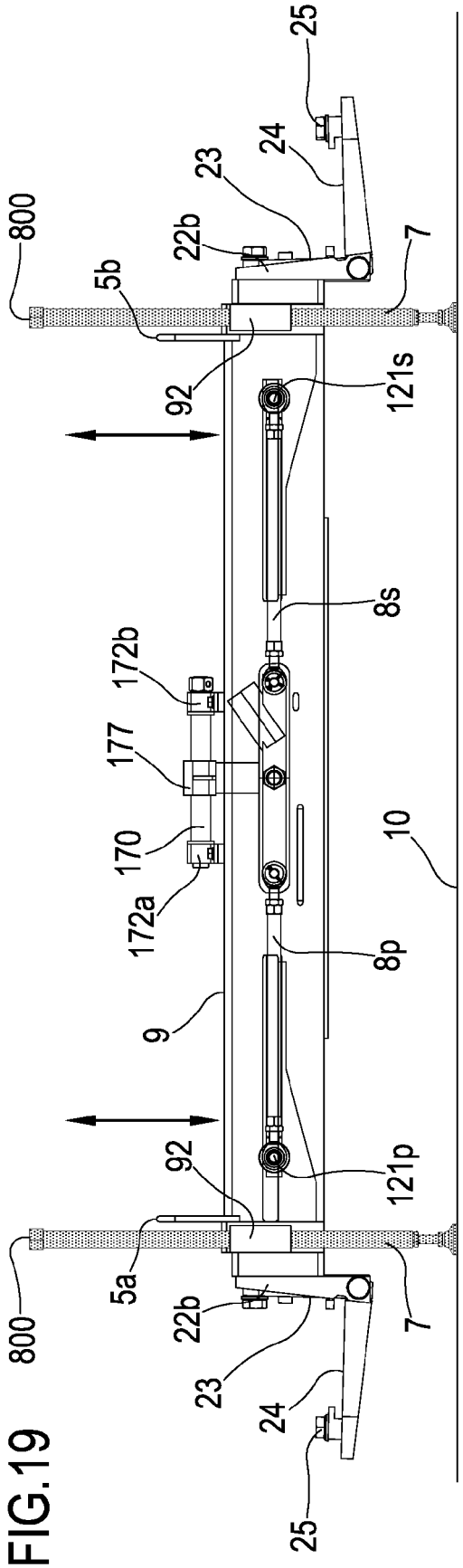
FIG.18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5a
800
22b
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25
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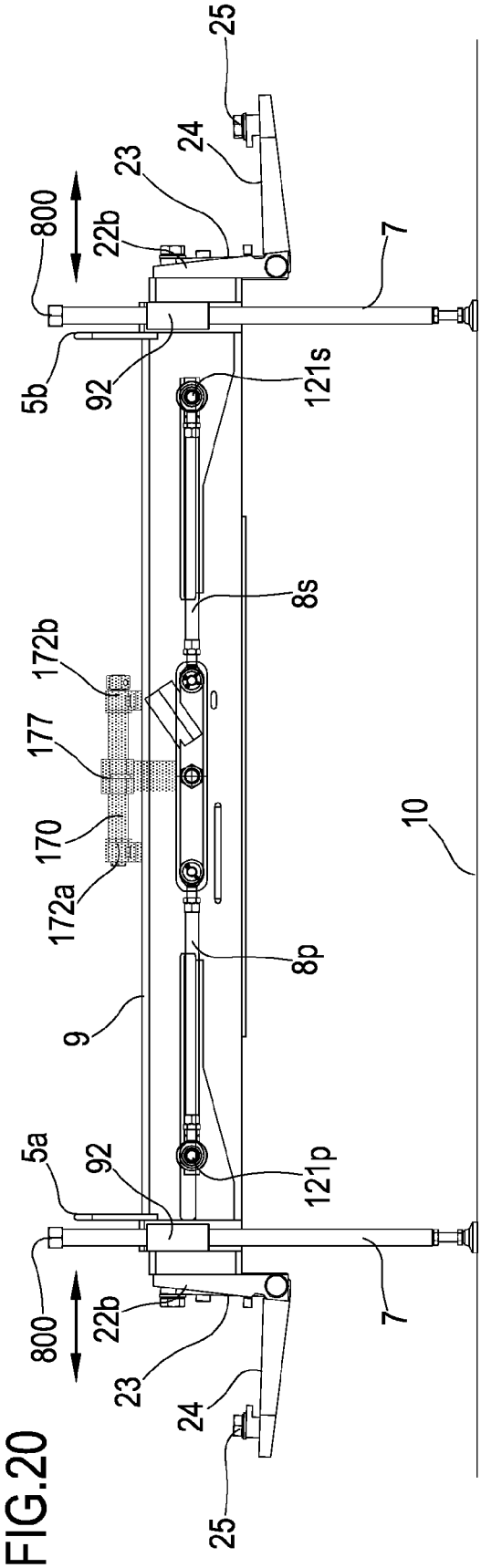
FIG.19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8s
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172a
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5a
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121p
800
22b
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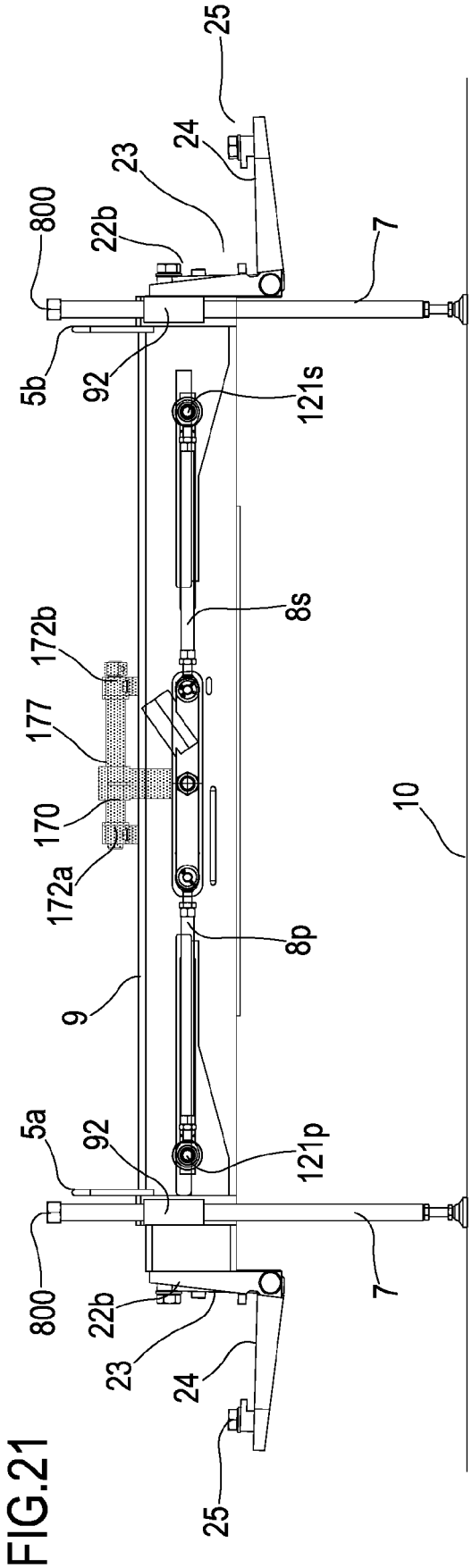
FIG.20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800
22b
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25
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FIG.21

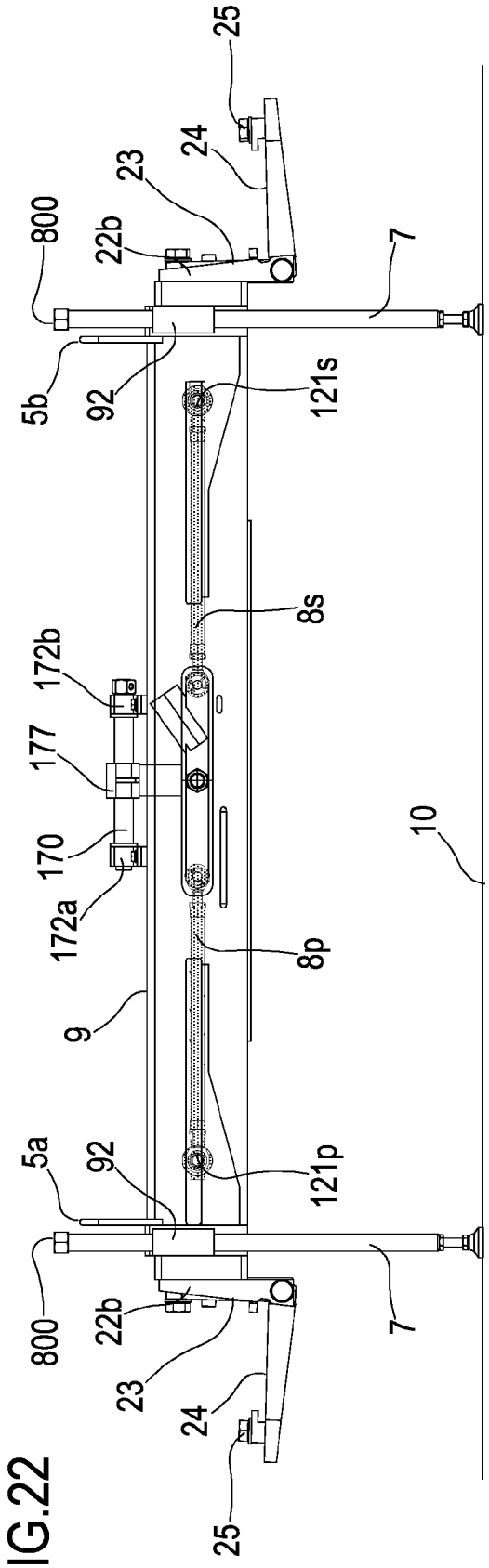
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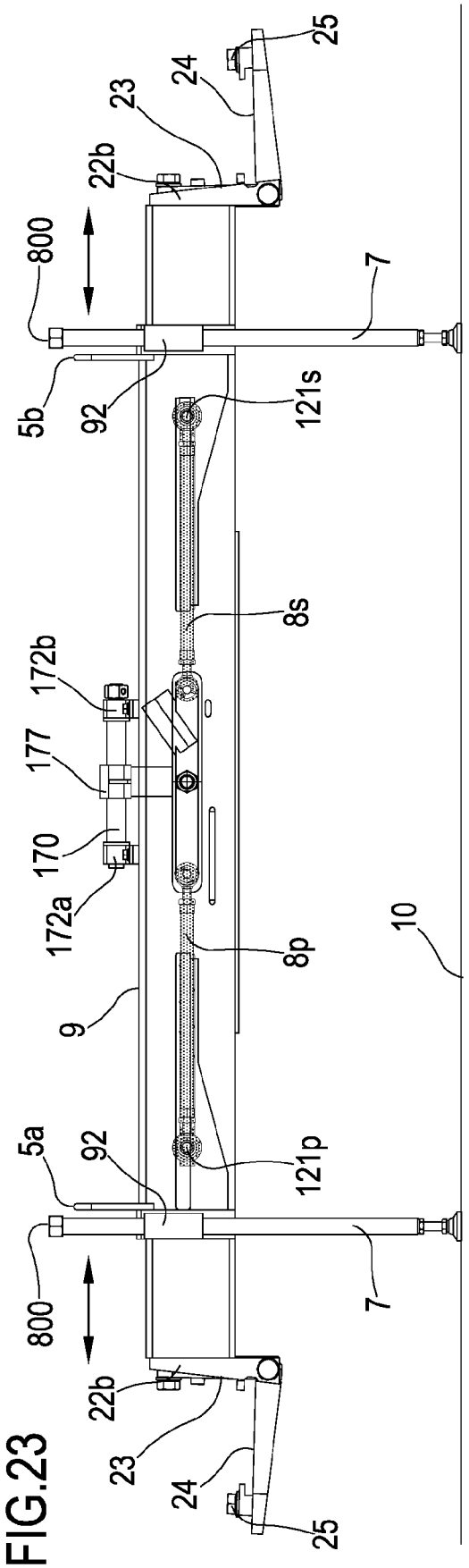
FIG.22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800
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FIG.23

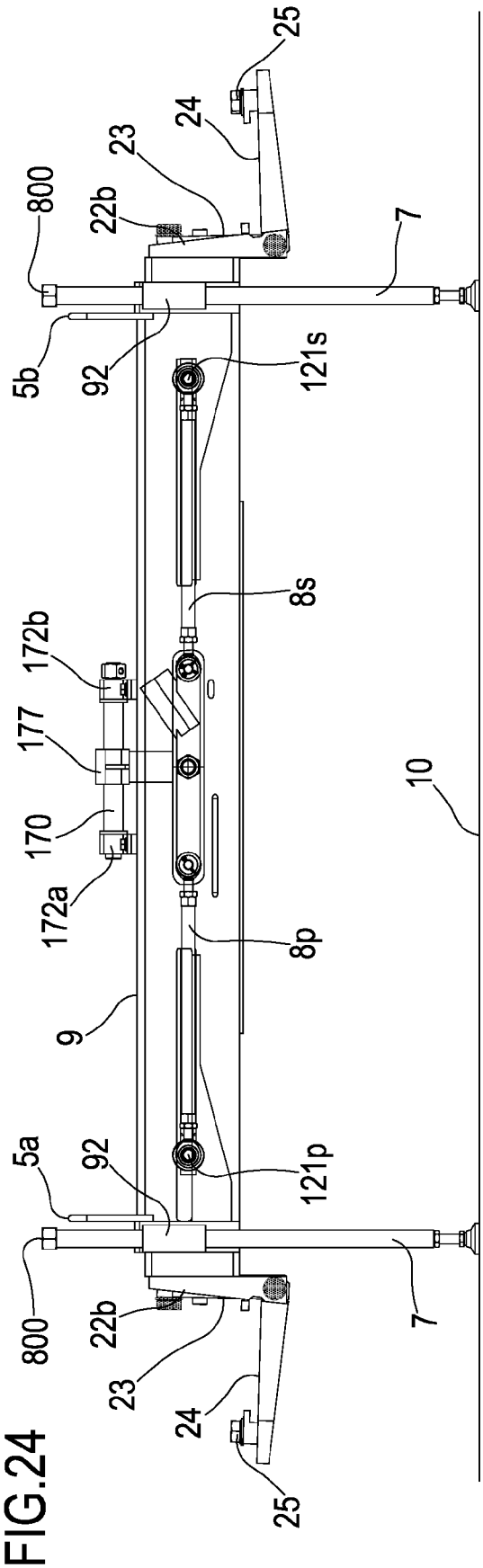
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FIG.24

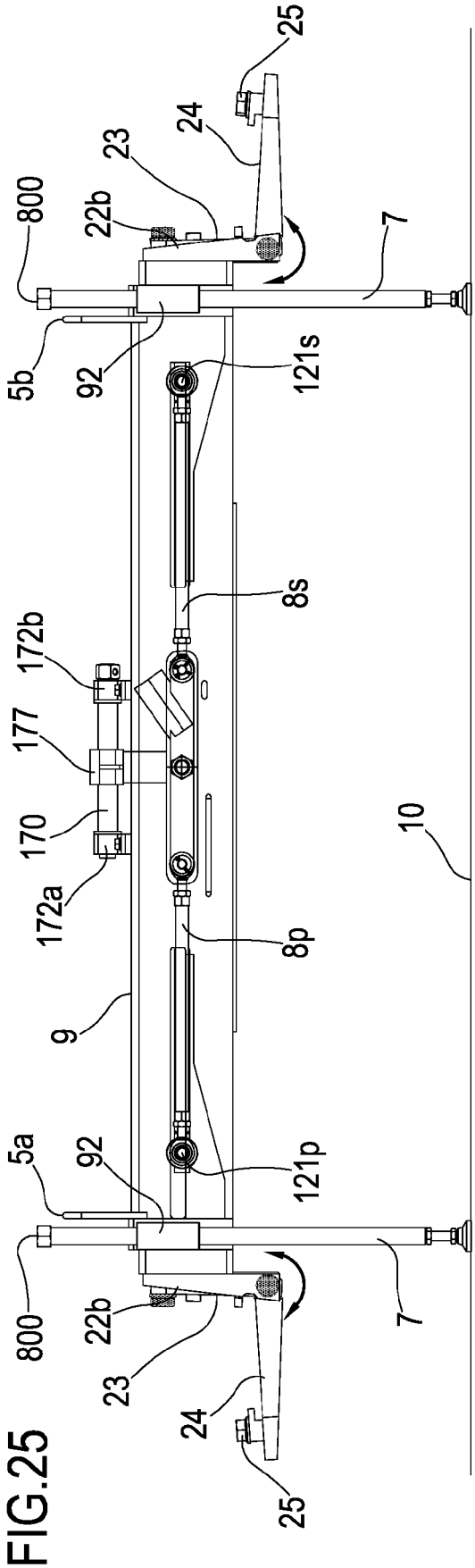
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FIG.25

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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 1473

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A,D	WO 2013/030723 A1 (RTE TECHNOLOGIE GMBH [AT]; KOWALSKI MARTIN [DE]; AL-THUWAINY TARIG [AT) 7 March 2013 (2013-03-07) * page 7, paragraph [33] - page 8, paragraph [35]; figures 1-6 * -----	1-16	INV. E01B1/00 E01B29/40
A	WO 2004/065692 A1 (PFLEIDERER INFRASTRUKTURT GMBH [DE]; WIRTZ HEINZ-PETER [DE]; PIERINGER) 5 August 2004 (2004-08-05) * page 5, lines 1-17; figures 1,5 * * page 6, lines 5-19 * -----	1-16	
			TECHNICAL FIELDS SEARCHED (IPC) E01B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 February 2018	Fernandez, Eva

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08-02-2018

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