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(54) **RAILWAY BOGIE EQUIPPED WITH A GAUGE VARYING SYSTEM, AND RAILWAY VEHICLE COMPRISING SUCH RAILWAY BOGIE**

EISENBAHNDREHGESTELL MIT EINEM SPURWECHSELSYSTEM UND SCHIENENFAHRZEUG MIT EINEM SOLCHEN EISENBAHNDREHGESTELL

BOGIE FERROVIAIRE ÉQUIPÉ D'UN SYSTÈME DE VARIATION DE JAUGE ET VÉHICULE FERROVIAIRE COMPRENANT UN TEL BOGIE FERROVIAIRE

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EP 3 885 232 B1

Description

[0001] The present invention concerns a railway bogie equipped with a gauge varying system, and a railway vehicle comprising such bogie.

[0002] As known, a bogie is a component of a railway vehicle which is provided with sets of wheels and carries the carbody of the vehicle above the rails.

[0003] In general, bogies are designed for railway lines having a standard or main reference gauge; for example, in central Europe the predominant standard gauge measures 1,435 mm.

[0004] In certain countries or areas, due to historical reasons or to specific characteristics of a territory, railway lines have different gauges; for example, in topographically challenging area, such as mountains, smaller gauges are sometimes used, e.g. gauges of 1,000 mm, usually referred to as the metric gauge.

[0005] Some solutions have been devised over the years in order to cope with these differences.

[0006] For instance, for many years the most commonly adopted solution has been that of simply transferring people and goods from a train to another having bogies suitable for the different upcoming gauge.

[0007] Clearly, such solution is extremely uncomfortable and implies unpleasant stops and longer journeys.

[0008] More recently, some other solutions have been studied in order to have bogies whose gauge can be varied while the railway vehicle passes through gauge changing facilities, and without substantially interrupting the travel of the railway vehicle itself.

[0009] For example, in the Spanish territory, where the standard gauge is wider than that of many central European lines, an installation system laid down on the ground interacts with the bogie while the railway vehicle is transiting, and forces a certain displacement of the wheels along their mounting axle, thus reducing their mutual distance and adapting the gauge of the bogie to a narrower railway line.

[0010] Unfortunately, this solution can be used only for short displacements, and therefore it is not suitable for being adopted when the differences between gauges are above a certain value, as it is the case for instance for the above mentioned central Europe standard gauge and the metric gauge.

[0011] Other solutions, described for instance in patent literature, have been proven to be very difficult or even impossible to be reduced to practice, for example due to complexity or to various technical constraints.

[0012] For example, patent document CH 703 173 A2 describes a solution where a bogie comprises two half frames supporting each a corresponding set of wheels, and wherein their mutual distance can be varied by means of two lateral arms protruding laterally outside the aligned set of wheels.

[0013] According to this solution, when the bogie enters an associated gauge changing installation, guiding rails of the installation facility have to be moved upward towards the lateral arms which enter inside them; by sliding, the arms follow the profile of the guiding rails and cause the displacement of one half frame relative to the other, and thus the variation of the whole gauge.

[0014] The solution described appears rather cumbersome from a constructive point of view, it may cause undesired vibrations and rotation of the bogie around a vertical axis perpendicular to the direction of travel; further, the presence of the arms protruding outside the frontal footprint of the wheel sets most likely may cause dangerous impacts, for example with trackside devices installed close to the tracks along a railway line. Bogies with gauge varying systems are also known from WO 2020/047852 A1 and WO 2009/101023 A1.

[0015] Hence, the present invention is aimed at providing a solution for railway bogies equipped with a gauge varying systems, which is suitable to face and at least partially mitigate at least some of the above mentioned issues and shortcomings.

[0016] Such aim is achieved by a bogie for a railway vehicle according to the invention, comprising:

- a first half-frame carrying a first set of wheels and a second half-frame carrying a second set of wheels, said first and second half-frames being movably connected to each other at least along a first axis transversal with respect to a travelling direction of the bogie along a railway line;
- a transverse bolster movable between a lowered position where it rests on and it is locked to the first and second half-frames, the first and second half-frames being at a first mutual distance corresponding to a first rail gauge, and a raised position where it is unlocked from and lifted above the first and second half-frames;
- a gauge varying system suitable to interact with a gauge varying installation which is positioned along the railway line and comprises a first supporting rail and a second supporting rail, and a plurality of guiding rails interposed there between;

characterized in that said gauge varying system comprises at least actuating means and a plurality of movable guided elements, wherein the movement of the transverse bolster from the lowered position to the raised position triggers said actuating means which then actuate said plurality of movable guided elements to move from a rest position to a working position at which each guided element slides inside and is guided by a corresponding guiding rail of said plurality of guiding rails, the guided sliding of the plurality of movable guided elements inside the corresponding guiding rails causing the displacement of at least one of the first and second half-frames along said first axis transversal to the travelling direction up to reaching a second mutual distance between the first and second half-frames corresponding to a second rail gauge.

[0017] According to some embodiments, the bogie

may comprise one or more of the following features, which may be combined in any technical feasible combination:

- with reference to said first axis transversal to the travelling direction, the movable guiding elements are each positioned and move from the rest position to the working position remaining within the space defined between the first set of wheels and the second set of wheels;
- the actuating means are hydraulic actuating means and comprise at least a first elastic element which is triggered by the movement of the transverse bolster from the lowered position to the raised position to cause the application of hydraulic pressure suitable to move at least a first subset of said plurality of movable guided elements from the rest position to the working position;
- the hydraulic actuating means comprise at least a first hydraulic container containing a liquid and said at least a first elastic element comprises a first spring housed inside the first hydraulic container and configured to pass from a pre-compressed position when the transverse bolster is in said lowered position, to an extended position when the transverse bolster moves to said raised position, thus causing, by means of said liquid, the application of said hydraulic pressure suitable to move said at least a first subset of the plurality of movable guided elements from the rest position to the working position;
- the hydraulic actuating means comprise a second elastic element which is triggered by the movement of the transverse bolster from the lowered position to the raised position to cause the application of hydraulic pressure suitable to move at least a second subset of the plurality of movable guided elements from the rest position to the working position;
- the hydraulic actuating means comprise a second hydraulic container containing a liquid and said at least a second elastic element comprises a second spring housed inside the second hydraulic container and configured to pass from a pre-compressed position when the transverse bolster is in said lowered position, to an extended position when the transverse bolster moves to said raised position thus causing, by means of said liquid, the application of said hydraulic pressure suitable to move at least said second subset of the plurality of movable guided elements from the rest position to the working position.
- the plurality of movable guided elements comprises at least a first pivot and an associated second pivot which are mounted in a first housing cylinder and in a corresponding second housing cylinder, movable along a second axis transversal to said first axis and to said travelling direction between said rest position, where they are each at least partially retracted inside the respective first and second housing cylinders, and said working position where they are each at least partially extracted outside the respective first and second housing cylinders and enter a first guiding rail and a respective second guiding rail of the installation;
- the plurality of movable guided elements further comprises a third pivot and an associated fourth pivot which are mounted in a third housing cylinder and in a corresponding fourth housing cylinder, movable along said second axis transversal to said first axis and to said travelling direction between a rest position where they are each at least partially retracted inside the respective first and second housing cylinders, and a working position where they are each at least partially extracted outside the respective first and second housing cylinders and enter a third guiding rail and a respective fourth guiding rail of the installation;
- the first hydraulic container is hydraulically connected to two housing cylinders, e.g. the first and third housing cylinders so that when said first spring passes from the pre-compressed position to the extended position, it causes the application of hydraulic pressure suitable to move at least two pivots, e.g. the first and third pivots, from their rest position to their working position;
- the second hydraulic container is hydraulically connected to two housing cylinders, e.g. the second and fourth housing cylinders so that when said second spring passes from the pre-compressed position to the extended position, it causes the application of hydraulic pressure suitable to move at least two pivots, e.g. the second and fourth pivots, from their rest position to their working position;
- a first telescopic bar and a second telescopic bar which interconnect, along the first axis transversal to the travelling direction said first and second half frames at a front part and at a respective rear part of the bogie, and wherein said first and second housing cylinders are mounted along the first telescopic bar spaced apart from each other of a first distance, and said third and fourth housing cylinders are mounted along the second telescopic bar, spaced apart from each other of a second distance different than said first distance;
- the gauge varying system further comprises lifting means which are configured to mechanically interact with the gauge varying installation and cause said transverse bolster to move from the lowered position to the raised position;
- the lifting means comprise a first swiveling arm carrying at least a first resting element and a second swiveling arm carrying at least a second resting element, said first and second swiveling arms being hinged at the first side end and at the second opposite side end of the transverse bolster, each reversibly movable between a retracted position towards the transverse bolster and an extracted position away from the transverse bolster where the at least

first resting element is brought to rest on and move relative to the first supporting rail and the at least second resting element is brought to rest on and move relative to the second supporting rail of the gauge varying installation;

- the first and second swiveling arms are configured to rotate around said at least first axis transversal to the travelling direction so that said at least a first resting element and said at least a second resting element remain in contact with the first supporting rail and the respective second supporting rail, notably when the at least a first resting element and the at least a second resting element are travelling along a rising portion or a descending portion of the first supporting rail and of the respective second supporting rail;
- the lifting means comprise a first actuating mechanism and a second actuating mechanism for actuating said first swiveling arm and the respective second swiveling arm to move between said retracted position and said extracted position, said first and second actuating mechanisms comprising each: at least an actuating piston connected to the respective first or second swiveling arm; a locking/unlocking lever which is hinged on the transverse bolster, spaced apart from the respective first or second swiveling arm, and comprises a hooked portion suitable to engage with/disengage from an associated portion in order to lock in/unlock from said lowered position the transverse bolster; an interconnecting lever which interconnects the locking/unlocking lever with the respective first or second swiveling arm, wherein the locking/unlocking lever, the interconnecting lever the actuating piston and the respective first or second swiveling arm of each of the first or second actuating mechanisms moving solidly with each other.

[0018] The above aim is also achieved by a railway vehicle comprising at least one bogie of the type above indicated, as per description hereinafter detailed, and in particular as defined in the attached relevant claims.

[0019] Further characteristics and advantages will become apparent from the description of some preferred but not exclusive exemplary embodiments of a railway bogie and related railway vehicle according to the present disclosure, illustrated only by way of non-limitative examples with the accompanying drawings, wherein:

Figure 1 is a perspective view illustrating a bogie for a railway vehicle according to the present invention when entering a gauge varying installation positioned along a railway line;

Figures 2 and 3 show the bogie of figure 1 in two successive positions along the gauge varying installation;

Figure 4 shows the boogie of figures 1-3 in a position close to leaving the gauge varying installation;

Figure 5 is a view schematically showing an exemplary embodiment of hydraulic actuating means used in a bogie according to the present invention;

Figures 6 and 7 are cross-section views showing the hydraulic actuating means illustrated figure 5 in two different positions;

Figures 8 and 9 are views schematically showing an exemplary embodiment of lifting means used in a bogie according to the present invention, in two different positions.

[0020] It should be noted that in the detailed description that follows, identical or similar components, either from a structural and/or functional point of view, may have the same reference numerals, regardless of whether they are shown in different embodiments of the present disclosure; it should also be noted that in order to clearly and concisely describe the present disclosure, the drawings may not necessarily be to scale and certain features of the disclosure may be shown in somewhat schematic form.

[0021] Further, when the term "adapted" or "arranged" or "configured" or "shaped", or a similar term is used herein while referring to any component as a whole, or to any part of a component, or to a combination of components, it has to be understood that it means and encompasses correspondingly either the structure, and/or the configuration and/or the form and/or the positioning.

[0022] In addition, when the term "substantial" or "substantially" is used herein, it has to be understood as encompassing an actual variation of plus or minus 5% with respect to an indicated reference value or position, and when the terms transversal or transversally are hereby used, they have to be understood as encompassing a direction non-parallel to the reference part(s) or direction(s)/axis they refer to, and perpendicularity has to be considered a specific case of transverse direction.

[0023] Finally, in the following description and claims, the numeral cardinals first, second, third et cetera..., will be used only for the sake of clarity of description and in no way they should be understood as limiting for whatsoever reason; in particular, the indication of a component referred to for instance as the "fourth ..." does not imply necessarily the presence or strict need of the preceding "first" or "second" or "third" ones, unless such presence is clearly evident for the correct functioning of the relevant embodiment(s) described, nor that the order should be the one exactly in the numerical sequence described with reference to the illustrated exemplary embodiment(s).

[0024] Figures 1-4 illustrate a bogie for a railway vehicle, indicated by the overall reference number 100, and therein shown in successive positions.

[0025] The bogie 100 comprises at least a first half-frame 10 carrying a first set of wheels 11, and a second half-frame 20 carrying a second set of wheels 12.

[0026] For the scope and in the way that will be described in more details hereinafter, the first half frame 10 and the second half-frame 11 are connected to each oth-

er, in a mutual movable manner at least along a first axis (Y) transversal with respect to a travelling direction (X) of the bogie 100 along a railway line.

[0027] For the sake of simplicity, in the attached relevant figures 1-4, the railway line is schematically represented by the illustrated couple of rails, and hereinafter it is referred to as the railway line 110.

[0028] According to an embodiment, the first and second half-frames 10 and 20 are movably connected to each other by means of at least one telescopic bar 15.

[0029] More in particular, in the exemplary embodiment the bogie 100 comprises a first telescopic bar 15 and a second substantially identical telescopic bar 25 (only partially visible in figures 2-4), which are positioned, with reference to the travel direction (X), on a front part and on a rear part of a transverse bolster 30 of the bogie 100.

[0030] The transverse bolster 30 is suitable to be connected to a carbody (not illustrated in the figures) of a railway vehicle; for example, according to solutions well known in the art and therefore not described herein in details, the connection is realized using one or more suspensions comprising, inter alia, an air spring 31 and a coupling pivot 32 positioned at the central part of the bolster 30.

[0031] In the bogie 100 according to the invention, the transverse bolster 30 is movable, together with the carbody once connected therewith, between a lowered position (figure 1) where the bolster 30 rests on and is locked to the first and second half-frames 10, 20 at a first mutual position thereof, and a raised position (see figures 2-4) where it is unlocked from and is lifted above the first and second half-frames 10, 20 from the first mutual position.

[0032] In the example of figure 1, the bolster 30 is in lowered position and is locked to the first and second half-frames 10, 20 at the first mutual distance corresponding to a first rail gauge y1; in particular, the first and second half-frames 10 and 20 are spaced along the first axis Y of a first mutual distance corresponding to the first rail gauge y1 (depicted in figure 2) which in this case is for example the metric gauge.

[0033] According to solutions well known in the art, or in any case readily available to those skilled in the art, the transverse bolster 30 can be anchored with the two half frames 10 and 20 by mutually engaging anchoring means which are provided on the two half frames 10 and 20 and along the body of the transverse bolster 30 itself, at different positions corresponding to different possible rail gauges.

[0034] The bogie 100 according to the invention further comprises a gauge varying system suitable to interact mechanically, while the bogie is travelling along the railway line 110, with a gauge varying installation, indicated by the overall reference number 1 in figure 2, which is positioned along the railway line 110.

[0035] As illustrated in figures 1-4, the installation 1 comprises for example a first lateral supporting rail 2 and a second lateral supporting rail 3, which are parallel and substantially identical to each other, and which, when seen on a side view, present both a profile whose height varies along the travelling direction (X), and in particular with an initial rising ramp, indicated in figure 1 by the reference number 8, and a decreasing ramp towards the final end of the installation, indicated in figure 4 by the reference number 9. The intermediate portion between the two ramps 8 and 9 can be straight at the same maximum height of the initial ramp 8.

[0036] The exemplary installation 1 illustrated further comprises a plurality of guiding rails which are interposed between the first and second supporting rails 2 and 3 and which extend along the travelling direction (X) of the bogie 100.

[0037] In particular, as better visible in figures 2 and 3, the plurality of guiding rails of the installation 1 comprises a first couple of mutually associated rails, namely a first guiding rail 4 and a second guiding rail 5, and a second couple of mutually associated guiding rails, namely a third guiding rail 6 and a fourth guiding rail 7; the first and second guiding rails 4 and 5 are positioned between the third and fourth guiding rails 6 and 7.

[0038] Advantageously, the gauge varying system of the bogie 100 according to the present invention comprises at least actuating means, indicated in figure 5 by the overall reference number 220, and a plurality of movable guided elements 201, 202, 203, 204, wherein the movement of the transverse bolster 30 from the lowered position to the raised position triggers the actuating means 220 which then actuate the plurality of movable guided elements to move from a rest position to a working position at which each guided element 201, 202, 203 and 204 is brought to slide inside and is guided by a corresponding guiding rail 4, 5, 6, 7 of the installation 1.

[0039] According to an embodiment, the actuating means 220 are hydraulic actuating means which actuate hydraulically the plurality of movable guided elements to move from the rest position to the working position as above indicated.

[0040] Conveniently, each guided element 201, 202, 203, 204 is guided to slide inside and to follow the profile of the corresponding guiding rails 4, 5, 6 and 7 which extend in the travel direction (X); in this way, there is a displacement of at least one of the first and second half-frames 10 and 20 along the first axis (Y) transversal to the travelling direction (X) of the bogie 100 up to when a second mutual distance between the first and second half-frames 10 and 20 is reached.

[0041] This second mutual distance corresponds to a second rail gauge y2.

[0042] For example, when seen from a top view, and along the travelling direction (X), the first and second guiding rails 4 and 5, as well as correspondingly the third and fourth guiding rails 6 and 7, diverge from each other, at least for a portion thereof, indicated in figure 3 by the reference number 50 for both couple of rails 4-5 and 6-7; thus, the diverging portion of the profile of the guiding rails causes, in the exemplary sequence illustrated in the

figures 1-4, an increase of the mutual distance between the first and second half frame 10 and 20, with the first and second set of wheels 11 and 12 which are brought to a position corresponding to a wider rail gauge, e.g. the previously mentioned central European standard gauge.

[0043] Usefully, in the bogie 100 according to the present invention, the various guided elements 201, 202, 203 and 204 are positioned and move from the rest position to the working position (and vice-versa) remaining within the space delimited between the first set of wheels 11 and the second set of wheels 12, with reference to the transverse first axis (Y).

[0044] In this way, it is advantageously prevented that any part of the gauge varying system could protrude outside the tracks of the line 110, thus never violating the rail gauge and dangerously interfering with any piece of equipment installed along the railway line 110 itself.

[0045] As illustrated in the exemplary embodiment of figures 6 and 7, the hydraulic actuating means 220 comprise at least a first elastic element 221 which is triggered by the movement of the transverse bolster 30 from the lowered position to the raised position, and causes the application of hydraulic pressure suitable to move at least some of the movable guided elements 201, 202, 203, 204 from their rest position to their working position.

[0046] In particular, the hydraulic actuating means 220 further comprise at least a first hydraulic container 225 containing a liquid, such as for example oil, and the at least a first elastic element 221 comprises a first spring 221 housed inside the first hydraulic container 225 and configured to pass from a pre-compressed position (illustrated in figure 6), when the transverse bolster 30 is in the lowered position, to an extended position (illustrated in figure 7) when the transverse bolster 30 is lifted towards the raised position, thus causing the application of the hydraulic pressure suitable to move at least some of the plurality of movable guided elements 201, 202, 203, 204 from the rest position to the working position.

[0047] According to a further embodiment, also illustrated in figures 6 and 7, the hydraulic actuating means 220 comprise: a second elastic element 222 which is triggered by the movement of the transverse bolster 30 from the lowered position to the raised position to cause the application of hydraulic pressure suitable to move at least some of the movable guided elements from their rest position to their working position; and a second hydraulic container 226 containing a liquid, such as for example oil, wherein the second elastic element 222 comprises a second spring 222 housed inside the second housing container 226.

[0048] The second spring 222 is configured to pass from a pre-compressed position, when the transverse bolster 30 is in the lowered position, to an extended position when the transverse bolster 30 is lifted towards the raised position, thus causing, by means of the contained liquid, the application of the hydraulic pressure suitable to move at least some of the plurality of movable guided elements from the rest position to the working position.

[0049] According to the exemplary embodiment of figures 5-7, the plurality of movable guided elements comprises at least a couple of pivots, for example a first pivot 201 and an associated second pivot 202 which are mounted in a first housing cylinder 211 and in a corresponding second housing cylinder 212, respectively; in particular, the first and second pivots 201 and 202 are movable along a substantially vertical second axis (Z) transversal to both the first axis (Y) and to the travelling direction (X), between the rest position where they are each at least partially retracted inside the respective first and second cylinders 211 and 212, as visible in figure 6, and the working position where they are each at least partially extracted outside the respective first and second cylinders 211 and 212, as visible in figure 7, in order to enter into the associated guiding rails 4 and 5 of the installation 1; as partially illustrated in figures 3-4.

[0050] According to a further possible embodiment of the bogie 100 according to the invention, also illustrated in figures 5-7, the plurality of movable guided elements further comprises a second couple of pivots, for instance a third pivot 203 and an associated fourth pivot 204 which are mounted in a third housing cylinder 213 and in a corresponding fourth housing cylinder 214, respectively; in particular, the third and fourth pivots 203 and 204 are also movable along the mentioned substantially vertical second axis (Z) transversal to both the first axis (Y) and to the travelling direction (X), between the rest position where they are each at least partially retracted inside the respective third and fourth housing cylinders 213 and 214, and the working position where they are each at least partially extracted outside the respective third and fourth housing cylinders 213 and 214, in order to enter each into an associated guiding rail 5 and 6 of the installation 1.

[0051] According to an embodiment, the first and third housing cylinders 211 and 213 are in hydraulic communication, via one or more cables 228, with the first hydraulic container 225 housing the first spring 221 which, when triggered following the lifting of the transverse bolster 30, causes, by means of the contained liquid, the application of hydraulic pressure to both the first and third pivots 201 and 203, which are actuated to move from their rest position to their working position.

[0052] According to this exemplary embodiment, the third and fourth cylinders 213 and 214 are in hydraulic communication, via one or more cables 228, with the second hydraulic container 226 housing the second spring 222 which, when triggered following the lifting of the transverse bolster 30, causes the application of hydraulic pressure to both the second and fourth pivots 202 and 204, which are actuated to move from their rest position to their working position.

[0053] The retracted and extended positions of the second and fourth pivots 202 and 204 are substantially the same positions illustrated for the first and third pivots 201 and 203 illustrated in figures 6 and 7, respectively.

[0054] Clearly, the solution devised in the present in-

vention allows a high degree of flexibility in realizing various different alternatives; for example, the first hydraulic container 225 housing the first spring 221 can be in hydraulic communication with the first and second housing cylinders 211 and 212 via one or more cables 228a, illustrated with dotted lines in figure 5, and when triggered following the lifting of the transverse bolster 30, they can cause the actuation of the first and second pivots 201 and 202 to move from their rest position to their working position. Likewise, the second hydraulic container 226 housing the second spring 222 can be in hydraulic communication with the third and fourth housing cylinders 213 and 214 via one or more similar cables 228a, and when triggered following the lifting of the transverse bolster 30, they can cause the actuation of the third and fourth pivots 203 and 204 to move from their rest position to their working position.

[0055] The first and second cylinders 211 and 212, together with their respective first and second pivots 201, 202, are installed along the first telescopic bar 15 which interconnects the first and second half frames 10, 20 along the transverse direction (Y), at a front part of the transverse bolster 30, as for example illustrated in figures 1-4.

[0056] The third and fourth cylinders 213 and 214, together with their respective third and fourth pivots 203 and 204, are installed along the second telescopic bar 25 which interconnects the first and second half frames 10, 20 along the transverse direction (Y), at a rear part of the transverse bolster 30, as for example partially visible in figures 1-4.

[0057] Preferably, the first and second housing cylinders 211 and 212 are installed along the first telescopic bar 15 so that the first and second pivots 201, 202 housed therein are spaced apart from each other of a first distance measured along the first transverse axis (Y) and with reference to their axes; in turn, the third and fourth housing cylinders 213 and 214 are installed along the second telescopic bar 25 so that the third and fourth pivots 203 and 204 housed therein are spaced apart from each other of a second distance measured along the same first transverse axis (Y), and with reference to their axes.

[0058] Preferably, as schematically represented in figure 5, the second distance is longer that said first distance.

[0059] In this way, while the bogie 100 is moving in the travelling direction (X), also the third and fourth pivots 203 and 204 slide inside and are guided each by the profile of the corresponding guiding rails; in particular, the presence of the four guided pivots 201, 202, 203 and 204 prevents undesired rotations of the bogie 100 around the vertical axis (Z) and ensures a steady movement of the half-frames 10 and 20, thus eliminating, or at least reducing, the likelihood of their jamming.

[0060] According to a possible embodiment schematically illustrated in figures 8 and 9, the first hydraulic container 225 together with the first spring 221 are at least partially fitted in a space provided between the transverse bolster 30 and the first half-frame 10, e.g. towards the first end 33 of the transverse bolster 30.

[0061] In turn, the second hydraulic container 226 together with the second spring 222 are at least partially fitted in a space provided between the transverse bolster 30 and the second half-frame 20, e.g. towards the second opposite end 34 of the transverse bolster 30, in a configuration symmetric with respect to that illustrated in figure 8 for the first hydraulic container and the related first spring 222.

[0062] In particular, the first assembly comprising the first hydraulic container 225-first spring 221, and the second assembly comprising the second hydraulic 226-second spring 222 are positioned, with respect to the travel direction (X), symmetrically to each other towards the two opposite ends 33 and 34 of the transverse bolster 30.

[0063] Usefully, in the bogie 100 according to the present invention, the gauge varying system further comprises lifting means, indicated in figures 8 and 9 by the overall reference number 250, which are configured to interact, when the bogie 100 is travelling, with the first and the second supporting rails 2 and 3, respectively, and thus to cause the transverse bolster 30 to be lifted from the lowered position to the raised position.

[0064] In the exemplary embodiments illustrated, the lifting means 250 comprise a first swiveling arm 251 carrying at least a first resting element and a second swiveling arm 252 carrying at least a second resting element, wherein the first and second swiveling arms 251 and 252 are provided at the first side end 33 and at the second opposite side end 34 of the transverse bolster 30, respectively.

[0065] Preferably, the at least a first resting element comprises at least a couple of rollers 253 pivotally hinged onto the first swiveling arm 251, and the second resting element comprises at least another couple of rollers 254 pivotally hinged onto the second swiveling arm 252.The presence of at least a couple of rollers for each swiveling arm, guarantees mechanical redundancy, and as a whole a more controllable supporting force and a more reliable transverse guidance.

[0066] The first swiveling arm 251 is hinged at the first side end 33 of the transverse bolster 30, reversibly movable between a retracted position towards the body of transverse bolster 30, as illustrated in figure 8, and an extracted position where it is swiveled away from the transverse bolster 30, as illustrated in figure 9; in this extracted position, the first resting element, and in particular the first couple of rollers 253 are brought each to rest on and move relative to the first supporting rail 2 of the installation 1, as illustrated in figures 1-4.

[0067] Each resting element is devised to provide redundancy and at least a degraded mode in which it still rolls on the corresponding supporting rail in case a part of the resting element breaks.

[0068] Conveniently,, at least one of the swiveling arms 251, 252, preferably both, are configured to rotate at least

around the first axis (Y) transversal to the travelling direction (X) so that the respective first and second resting elements 253 and 254 are always in contact with the corresponding supporting rails 2 and 3, notably while they are travelling, and in particular rolling on the rising and descending parts 8, 9 of the rails 2, 3 themselves.

[0069] Usefully, at least one of the swiveling arms 251, 252, preferably both, are also configured to rotate around the axis defined by the travelling direction (X) thus providing a further degree of movement.

[0070] Likewise, the second swiveling arm 252 is hinged at the second opposite end 34 of the transverse bolster 30, reversibly movable between a retracted position (equivalent to that illustrated in figure 8 for the first swiveling arm 251) towards the body of transverse bolster 30, and an extracted position where it is swiveled away from the transverse bolster 30, equivalent to that illustrated in figure 9 for the first swiveling arm 251; in this extracted position, the second resting element, and in particular the second couple of rollers 254 are brought each to rest on and move relative to the second supporting rail 3 of the installation 1, as illustrated in the figures 1-4.

[0071] According to the exemplary embodiment illustrated in figures 8 and 9, the lifting means 250 comprise a first actuating mechanism and a second actuating means for actuating the first swiveling arm 251 and respectively the second swiveling arm 252 to move between the respective retracted position and the extracted position above indicated.

[0072] According to a possible embodiment, the first and second actuating mechanisms are substantially identical to each other and are positioned, symmetrically with respect to the travelling direction (X), at the two opposite ends 33 and 34 of the transverse bolster 30; hence, in the relevant figures, for the sake of simplicity, only the first actuating means, positioned at the first end 33 of the bolster 30, are illustrated and will be described herein.

[0073] As illustrated in figures 8 and 9, the first actuating mechanism comprises: an actuating piston 260 which is connected to the first swiveling arm 251 and is partially housed inside a cylinder 261 wherein there could be housed also an associated return spring 262; a looking/unlocking lever 263, for example elbow-shaped, which is hinged on the transverse bolster 30, spaced apart from the first swiveling arm 251, and is provided with a hooking portion 264 suitable to engage a corresponding portion 35 of the bolster and advantageously of the corresponding half-frame 10, in order to lock to/unlock from the lowered position the bolster 30 itself and notably to lock to/unlock from the retracted position the corresponding swiveling arm; and an interconnecting lever 265, e.g. a curved lever, which interconnects the first swiveling arm 251 with the looking/unlocking lever 263. In particular, the interconnecting lever 265, the first swiveling arm 251, the piston 260, and the looking/unlocking 263 move solidly together when the first actuating mechanism is activated, for example by an operator.

[0074] Clearly, as above indicated the second actuating mechanism positioned on the opposite end 34 of the transverse bolster 30, comprises the same components working substantially in the same manner, namely a second actuating piston 260 which is partially housed inside a second cylinder 261 together with a second return spring 262, and which is connected to the second swiveling arm 252; a second looking/unlocking 263 which is hinged on the transverse bolster 30, spaced apart from the second swiveling arm 252, and is provided with a respective hooking portion 264 suitable to engage a corresponding portion 35 of the bolster 30 and advantageously of the corresponding half-frame 20 in order to lock to/unlock from the lowered position the bolster 30 itself and notably to lock to/unlock from the retracted position the corresponding swiveling arm; and a second interconnecting lever 265, e.g. a curved lever, which interconnects the second swiveling arm 252 with the second elbow-shaped lever 263, with the second interconnecting lever 265, the second arm 252 and the second elbow-shaped lever 263 which move solidly together when the second actuating mechanism is activated, together with the first actuating mechanism, for example by an operator.

[0075] In practice, when a railway vehicle including a bogie 100 according to the invention is approaching a section of a railway line 110 where there is a change of rail gauge, an operator, for example on board the vehicle itself, can activate the lifting means 250, and in particular its first and second actuating means, for example by means of any suitable control system.

[0076] In this way, each actuating piston 260, by sliding causes the swiveling of the first and second swiveling arms 251 and 252 which move from their retracted position illustrated in figure 8 to the extracted position illustrated in figure 9.

[0077] In this movement, via the interconnecting curved levers 265, the two elbow-shaped levers 263 rotate each about the respective hinge point; accordingly, their hooking portions 264 disengage each from the associated portion 35 of the transverse bolster 30, thus unlocking it from the lowered position.

[0078] Then, once the railway vehicle enters the area of the installation 1, the rollers 253 of the first swivel arm 251 rest on and slide relative to the first supporting rail 2, while the rollers 254 of the second swivel arm 252 rest on and slide relative to the second supporting rail 3.

[0079] In this way, when the rollers travel along the ascending portion 8 of the supporting rails 2 and 3, the transverse bolster 30 is lifted above the two half frames 10 and 20 which are unlocked (de-anchored with respect to the transverse bolster) from the previous position corresponding to a first rail gauge.

[0080] Accordingly, the first and second springs 221 and 222 are triggered and, as previously described, cause the application of hydraulic pressure to the first, second, third and fourth pivots 201, 202, 203 and 204 which are actuated to move from the rest position to the

working position where they enter each the corresponding guiding rail 4, 5, 6 and 7.

[0081] As a consequence, while the railway vehicle continues its travel along the direction (X), the four pivots 201-204 slide inside and are guided by the profile of the four guiding rails 4-7, thus causing the mutual displacement of the two half-frames 10 and 20, until they reach the position corresponding to the second rail gauge, as illustrated in figure 4.

[0082] Then, when the railway vehicle is going to leave the area of the installation 1, the rollers 253 and 254 travel along the descending part 9 of the supporting rails 2 and 3; as a consequence, the transverse bolster 30 lowers down until when it bears against and anchors the two half-frames 10 and 20 in the new position.

[0083] The lifting means can return from the position illustrated in figure 9 to the position illustrated in figure 8, where the hooking portions 264 engage each the corresponding portion 35 and thus lock again the transverse bolster 30 in the lowered position.

[0084] Hence, it is evident from the foregoing description that the bogie 100 according to the present invention allows achieving the intended aim since it allows to modify the gauge while the railway vehicle is travelling along a railway line, in an effective way.

[0085] The solution thus devised does not have components which violate any rail gauge, is mechanically stable and allows proper control of the lateral displacements along the axis (Y) transversal to the travelling direction (X), and which does not cause, or at least substantially minimize, undesired vibrations and rotations around a vertical axis (Z) perpendicular to the travel direction (X).

[0086] These results are achieved according to a solution which is easy to be used and implemented with various types of vehicles, be them for freight or passengers transportation; hence, the presence invention encompasses also a railway vehicle comprising one or more bogies 100 as previously described, and in particular as claimed in the relevant appended claims.

[0087] The bogie 100 thus conceived is susceptible of modifications and variations, all of which are within the scope of the inventive concept as defined by the appended claims, and contemplates any possible combination of the embodiments or parts thereof hereinbefore described; for example, in relation to the specific application, some of the components or parts described, can be shaped or positioned differently from what described, or there could be a number of components different from that described; the guided pivots 201-204 can move along the second transverse axis (Z), substantially vertically, or they can move along an axis inclined with respect to the vertical direction indicated in the exemplary embodiment illustrated; each elastic element can be associated with and cause the actuation of a different number of guided elements; et cetera.

Claims

1. A bogie (100) for a railway vehicle, comprising:

   - a first half-frame (10) carrying a first set of wheels (11) and a second half-frame (20) carrying a second set of wheels (12), said first and second half-frames (10, 20) being movably connected to each other at least along a first axis (Y) transversal with respect to a travelling direction (X) of the bogie along a railway line (110);
   - a transverse bolster (30) movable between a lowered position where it rests on and it is locked to the first and second half-frames (10, 20), the first and second half-frames being at a first mutual distance corresponding to a first rail gauge, and a raised position where it is unlocked from and lifted above the first and second half-frames (10, 20);
   - a gauge varying system suitable to interact with a gauge varying installation (1) which is positioned along the railway line (110) and comprises a first supporting rail (2) and a second supporting rail (3), and a plurality of guiding rails (4, 5, 6, 7) interposed there between;

   characterized in that said gauge varying system (200) comprises at least actuating means (220) and a plurality of movable guided elements (201, 202, 203, 204), wherein the movement of the transverse bolster (30) from the lowered position to the raised position triggers said actuating means which then actuate said plurality of movable guided elements to move from a rest position to a working position at which each guided element slides inside and is guided by a corresponding guiding rail of said plurality of guiding rails (4, 5, 6, 7), the guided sliding of the plurality of movable guided elements inside the corresponding guiding rails causing the displacement of at least one of the first and second half-frames (10,20) along said first axis (Y) transversal to the travelling direction (X) up to reaching a second mutual distance between the first and second half-frames corresponding to a second rail gauge.

2. A bogie (100) according to claim 1, wherein, with reference to said first axis (Y) transversal to the travelling direction (X), the movable guiding elements (201, 202, 203, 204) are each positioned and move from the rest position to the working position remaining within the space defined between the first set of wheels (11) and the second set of wheels (12).

3. A bogie (100) according to claim 1 or 2, wherein said actuating means are hydraulic actuating means (220) and comprise at least a first elastic element (221) which is triggered by the movement of the transverse bolster (30) from the lowered position to

the raised position to cause the application of hydraulic pressure suitable to move at least a first subset of said plurality of movable guided elements (201, 202, 203, 204) from the rest position to the working position.

4. A bogie (100) according to claim 3, wherein said hydraulic actuating means (220) comprise at least a first hydraulic container (225) containing a liquid and said at least a first elastic element (221) comprises a first spring (221) housed inside the first hydraulic container (225) and configured to pass from a pre-compressed position when the transverse bolster (30) is in said lowered position, to an extended position when the transverse bolster (30) moves to said raised position, thus causing, by means of said liquid, the application of said hydraulic pressure suitable to move said at least a first subset of the plurality of movable guided elements (201, 202, 203, 204) from the rest position to the working position.

5. A bogie (100) according to claim 4, wherein said hydraulic actuating means (220) comprise a second elastic element (222) which is triggered by the movement of the transverse bolster (30) from the lowered position to the raised position to cause the application of hydraulic pressure suitable to move at least a second subset of the plurality of movable guided elements (201, 202, 203, 204) from the rest position to the working position.

6. A bogie (100) according to one or more of the previous claims, wherein said plurality of movable guided elements comprises at least a first pivot (201) and an associated second pivot (202) which are mounted in a first housing cylinder (211) and in a corresponding second housing cylinder (212), movable along a second axis (Z) transversal to said first axis (Y) and to said travelling direction (X) between said rest position, where they are each at least partially retracted inside the respective first and second housing cylinders (211, 212), and said working position where they are each at least partially extracted outside the respective first and second housing cylinders (211, 212) and enter a first guiding rail (4) and a respective second guiding rail (5) of the installation (1).

7. A bogie (100) according to claim 6, wherein said plurality of movable guided elements further comprises a third pivot (203) and an associated fourth pivot (204) which are mounted in a third housing cylinder (213) and in a corresponding fourth housing cylinder (214), movable along said second axis (Z) transversal to said first axis (Y) and to said travelling direction (X) between said rest position where they are each at least partially retracted inside the respective third and fourth housing cylinders (213, 214), and said working position where they are each at least partially extracted outside the respective first and second housing cylinders (213, 214) and enter a third guiding rail (6) and a respective fourth guiding rail (7) of the installation (1).

8. A bogie (100) according to claims 4 and 7 wherein said first hydraulic container (225) is hydraulically connected to said first and third housing cylinders (211, 213) so that when said first spring (221) passes from the pre-compressed position to the extended position, it causes the application of hydraulic pressure suitable to move at least said first and third pivots (201, 203) from their rest position to their working position.

9. A bogie (100) according to claim 5, wherein said hydraulic actuating means (220) comprise a second hydraulic container (226) containing a liquid and said at least a second elastic element (221) comprises a second spring (222) housed inside the second hydraulic container (226) and configured to pass from a pre-compressed position when the transverse bolster (30) is in said lowered position, to an extended position when the transverse bolster (30) moves to said raised position thus causing, by means of said liquid, the application of said hydraulic pressure suitable to move at least said second subset of the plurality of movable guided elements (201, 202, 203, 204) from the rest position to the working position.

10. A bogie (100) according to claim 7 wherein it comprises a first telescopic bar (15) and a second telescopic bar (25) which interconnect, along the first axis (Y) said first and second half frames (10, 20) at a front part and at a respective rear part of the bogie, and wherein said first and second housing cylinders (211, 212) are mounted along the first telescopic bar (15) spaced apart from each other of a first distance, and said third and fourth housing cylinders (213, 214) are mounted along the second telescopic bar (25), spaced apart from each other of a second distance different than said first distance.

11. A bogie (100) according to one or more of the previous claims, wherein said gauge varying system (200) further comprises lifting means which are configured to mechanically interact with the gauge varying installation (1) and cause said transverse bolster (30) to move between the lowered position and the raised position.

12. A bogie (100) according to claim 11, wherein said lifting means comprise a first swiveling arm (251) carrying at least a first resting element (253) and a second swiveling arm (252) carrying at least a second resting element (254), said first and second swiveling arms (251, 252) being hinged at a first side end (33) and at a second opposite side end (33, 34)

of the transverse bolster (30), each reversibly movable between a retracted position towards the transverse bolster (30) and an extracted position away from the transverse bolster (30) where the at least first resting element (253) is brought to rest on and move relative to the first supporting rail (2) and the at least second resting element (254) is brought to rest on and move relative to the second supporting rail (3) of the gauge varying installation (1).

13. A bogie (100) according to claim 12, wherein said first and second swiveling arms (251, 252) are configured to rotate around said at least first axis (Y) transversal to the travelling direction (X) so that said at least first resting element (253) and said at least second resting element (254) remain in contact with the first supporting rail (2) and the respective second supporting rail (3), notably when the at least first resting element (253) and the at least second resting element (254) are travelling along a rising portion (8) or a descending portion (9) of the first supporting rail (2) and of the respective second supporting rail (3).

14. A bogie (100) according to claim 12 or 13, wherein said lifting means comprise a first actuating mechanism and a second actuating mechanism for actuating said first swiveling arm (251) and the respective second swiveling arm (252) to move between said retracted position and said extracted position, said first and second actuating mechanisms comprising each at least:

- an actuating piston (260) connected to the respective first or second swiveling arm (251, 252);
- a locking/unlocking lever (263) which is hinged on the transverse bolster (30), spaced apart from the respective first or second swiveling arm (251, 252), and comprises a hooked portion (264) suitable to engage with/disengage from an associated portion (35) in order to lock in/unlock from said lowered position the transverse bolster (30); and
- an interconnecting lever (265) which interconnects the locking/unlocking lever (263) with the respective first or second swiveling arm (251, 252),

wherein the locking/unlocking lever (263), the interconnecting lever (265), the actuating piston (260) of each of the first or second actuating mechanisms and the respective first or second swiveling arm (251, 252) moving solidly with each other.

15. A railway vehicle **characterized in that** it comprises at least one bogie (100), according to one or more of the preceding claims.

Patentansprüche

1. Drehgestell (100) für ein Schienenfahrzeug, umfassend:

- einen ersten Halbrahmen (10), der einen ersten Radsatz (11) trägt, und einen zweiten Halbrahmen (20), der einen zweiten Radsatz (12) trägt, wobei der erste und der zweite Halbrahmen (10, 20) zumindest entlang einer ersten Achse (Y) quer zu einer Fahrtrichtung (X) des Drehgestells entlang einer Eisenbahnstrecke (110) beweglich miteinander verbunden sind;
- einen Querträger (30), der zwischen einer abgesenkten Position, in der er auf dem ersten und dem zweiten Halbrahmen (10, 20) aufliegt und mit diesen verriegelt ist, wobei der erste und der zweite Halbrahmen in einem ersten gegenseitigen Abstand sind, der einer ersten Schienenspurweite entspricht, und einer angehobenen Position, in der er von dem ersten und dem zweiten Halbrahmen (10, 20) entriegelt und darüber angehoben ist, beweglich ist;
- ein Spurweitenveränderungssystem, das geeignet ist, um mit einer Spurveränderungsanlage (1) zusammenzuwirken, die entlang der Eisenbahnlinie (110) positioniert ist und eine erste Tragschiene (2) und eine zweite Tragschiene (3) und eine Vielzahl von dazwischen angeordneten Führungsschienen (4, 5, 6, 7) umfasst;

dadurch gekennzeichnet, dass das Spurweitenveränderungssystem (200) mindestens eine Betätigungseinrichtung (220) und eine Vielzahl von beweglichen geführten Elementen (201, 202, 203, 204) umfasst, wobei die Bewegung des Querträgers (30) aus der abgesenkten Position in die angehobene Position die Betätigungseinrichtung auslöst, die dann die Vielzahl von beweglichen geführten Elementen betätigt, um sich aus einer Ruheposition in eine Arbeitsposition zu bewegen, in der jedes geführte Element innerhalb einer entsprechenden Führungsschiene der Vielzahl von Führungsschienen (4, 5, 6, 7) gleitet und von einer entsprechenden Führungsschiene der Vielzahl von Führungsschienen geführt wird, wobei das geführte Gleiten der Vielzahl von beweglichen geführten Elementen innerhalb der entsprechenden Führungsschienen die Verschiebung von mindestens einem von dem ersten und dem zweiten Halbrahmen (10, 20) entlang der ersten Achse (Y) quer zu der Fahrtrichtung (X) bis zum Erreichen eines zweiten gegenseitigen Abstands zwischen dem ersten und dem zweiten Halbrahmen, der einer zweiten Schienenspur entspricht, bewirkt.

2. Drehgestell (100) nach Anspruch 1, wobei die beweglichen Führungselemente (201, 202, 203, 204), mit Bezugnahme auf die erste Achse (Y) quer zu der

Fahrtrichtung (X), jeweils innerhalb des zwischen dem ersten Radsatz (11) und dem zweiten Radsatz (12) definierten Raums positioniert sind und sich aus der Ruheposition in die Arbeitsposition bewegen.

3. Drehgestell (100) nach Anspruch 1 oder 2, wobei die Betätigungseinrichtungen hydraulische Betätigungseinrichtungen (220) sind und mindestens ein erstes elastisches Element (221) umfassen, das durch die Bewegung des Querträgers (30) aus der abgesenkten Position in die angehobene Position ausgelöst wird, um die Anwendung eines hydraulischen Drucks zu bewirken, der geeignet ist, um mindestens eine erste Untergruppe der Vielzahl von beweglichen Führungselementen (201, 202, 203, 204) aus der Ruheposition in die Arbeitsposition zu bewegen.

4. Drehgestell (100) nach Anspruch 3, wobei die hydraulischen Betätigungseinrichtungen (220) mindestens einen ersten Hydraulikbehälter (225) umfassen, der eine Flüssigkeit enthält, und das mindestens eine erste elastische Element (221) eine erste Feder (221) umfasst, die innerhalb des ersten Hydraulikbehälters (225) untergebracht und konfiguriert ist, um aus einer vorkomprimierten Position, wenn sich der Querträger (30) in der abgesenkten Position befindet, in eine ausgefahrene Position überzugehen, wenn sich der Querträger (30) in die angehobene Position bewegt, wodurch mittels der Flüssigkeit die Anwendung des hydraulischen Drucks bewirkt wird, der geeignet ist, die zumindest eine erste Untergruppe der Vielzahl von beweglichen geführten Elementen (201, 202, 203, 204) aus der Ruheposition in die Arbeitsposition zu bewegen.

5. Drehgestell (100) nach Anspruch 4, wobei die hydraulischen Betätigungseinrichtungen (220) ein zweites elastisches Element (222) umfassen, das durch die Bewegung des Querträgers (30) aus der abgesenkten Position in die angehobene Position ausgelöst wird, um die Anwendung eines hydraulischen Drucks zu bewirken, der geeignet ist, um mindestens eine zweite Untergruppe der Vielzahl von beweglichen geführten Elementen (201, 202, 203, 204) aus der Ruheposition in die Arbeitsposition zu bewegen.

6. Drehgestell (100) nach einem oder mehreren der vorherigen Ansprüche, wobei die Vielzahl von beweglichen Führungselementen mindestens einen ersten Drehzapfen (201) und einen assoziierten zweiten Drehzapfen (202) umfassen, die in einem ersten Gehäusezylinder (211) und in einem entsprechenden zweiten Gehäusezylinder (212) montiert sind, der entlang einer zweiten Achse (Z) quer zu der ersten Achse (Y) und zu der Fahrtrichtung (X) zwischen der Ruheposition, in der sie jeweils zumindest teilweise in die jeweiligen ersten und zweiten Gehäusezylinder (211, 212) eingezogen sind, und der Arbeitsposition, in der sie jeweils zumindest teilweise aus den jeweiligen ersten und zweiten Gehäusezylindern (211, 212) herausgezogen sind und in eine erste Führungsschiene (4) und eine jeweilige zweite Führungsschiene (5) der Anlage (1) eintreten, beweglich ist.

7. Drehgestell (100) nach Anspruch 6, wobei die Vielzahl von beweglichen Führungselementen ferner einen dritten Drehzapfen (203) und einen zugehörigen vierten Drehzapfen (204) umfassen, die in einem dritten Gehäusezylinder (213) und in einem entsprechenden vierten Gehäusezylinder (214) montiert sind, die entlang der zweiten Achse (Z) quer zu der ersten Achse (Y) und zu der Fahrtrichtung (X) zwischen der Ruheposition, in der sie jeweils zumindest teilweise in den jeweiligen dritten und vierten Gehäusezylinder (213, 214) eingezogen sind, und der Arbeitsposition, in der sie jeweils zumindest teilweise aus dem jeweiligen ersten und zweiten Gehäusezylinder (213, 214) herausgezogen sind und in eine dritte Führungsschiene (6) und eine jeweilige vierte Führungsschiene (7) der Anlage (1) eintreten, beweglich sind.

8. Drehgestell (100) nach einem der Ansprüche 4 und 7, wobei der erste Hydraulikbehälter (225) hydraulisch mit dem ersten und dem dritten Gehäusezylinder (211, 213) verbunden ist, sodass die erste Feder (221), wenn sie von der vorgespannten Position in die ausgefahrene Position übergeht, das Anlegen eines hydraulischen Drucks bewirkt, der geeignet ist, um mindestens den ersten und den dritten Drehzapfen (201, 203) aus seiner Ruheposition in seine Arbeitsposition zu bewegen.

9. Drehgestell (100) nach Anspruch 5, wobei die hydraulischen Betätigungseinrichtungen (220) einen zweiten Hydraulikbehälter (226) umfassen, der eine Flüssigkeit enthält, und das mindestens zweite elastische Element (221) eine zweite Feder (222) umfasst, die innerhalb des zweiten Hydraulikbehälters (226) untergebracht und konfiguriert ist, um aus einer vorkomprimierten Position, wenn sich der Querträger (30) in der abgesenkten Position befindet, in eine ausgefahrene Position überzugehen, wenn sich der Querträger (30) in die angehobene Position bewegt, wodurch mittels der Flüssigkeit die Anwendung des hydraulischen Drucks bewirkt wird, der geeignet ist, um mindestens die zweite Untergruppe der Vielzahl von beweglichen geführten Elementen (201, 202, 203, 204) aus der Ruheposition in die Arbeitsposition zu bewegen.

10. Drehgestell (100) nach Anspruch 7, wobei es eine erste Teleskopstange (15) und eine zweite Teles-

kopstange (25) umfasst, die entlang der ersten Achse (Y) den ersten und den zweiten Halbrahmen (10, 20) an einem vorderen Teil und an einem jeweiligen hinteren Teil des Drehgestells miteinander verbinden, und wobei der erste und der zweite Gehäusezylinder (211, 212) entlang der ersten Teleskopstange (15) in einem ersten Abstand voneinander angebracht sind und der dritte und der vierte Gehäusezylinder (213, 214) entlang der zweiten Teleskopstange (25) in einem zweiten Abstand voneinander angebracht sind, der sich von dem ersten Abstand unterscheidet.

11. Drehgestell (100) nach einem oder mehreren der vorherigen Ansprüche, wobei das Spurweitenveränderungssystem (200) ferner Hebeeinrichtungen umfasst, die konfiguriert sind, um mechanisch mit der Spurweitenveränderungsanlage (1) zusammenzuwirken und zu bewirken, dass sich der Querträger (30) zwischen der abgesenkten Position und der angehobenen Position bewegt.

12. Drehgestell (100) nach Anspruch 11, wobei die Hebeeinrichtungen einen ersten Schwenkarm (251), der mindestens ein erstes Auflageelement (253) trägt, und einen zweiten Schwenkarm (252), der mindestens ein zweites Auflageelement (254) trägt, umfassen, wobei der erste und der zweite Schwenkarm (251, 252) an einem ersten Seitenende (33) und an einem zweiten gegenüberliegenden Seitenende (33, 34) des Querträgers (30) angelenkt sind, die jeweils reversibel zwischen einer eingezogenen Position in Richtung Querträger (30) und einer ausgezogenen Position weg vom Querträger (30) beweglich sind, wobei das mindestens erste Auflageelement (253) auf der ersten Tragschiene (2) aufliegt und sich in Bezug auf diese bewegt und das mindestens zweite Auflageelement (254) auf der zweiten Tragschiene (3) der Spurweitenveränderungsanlage (1) aufliegt und sich in Bezug auf diese bewegt.

13. Drehgestell (100) nach Anspruch 12, wobei der erste und der zweite Schwenkarm (251, 252) konfiguriert sind, um sich um die mindestens erste Achse (Y) quer zu der Fahrtrichtung (X) zu drehen, sodass das mindestens erste Auflageelement (253) und das mindestens zweite Auflageelement (254) in Kontakt mit der ersten Tragschiene (2) und der jeweiligen zweiten Tragschiene (3) bleiben, insbesondere, wenn das mindestens erste Auflageelement (253) und das mindestens zweite Auflageelement (254) entlang eines ansteigenden Abschnitts (8) oder eines abfallenden Abschnitts (9) der ersten Tragschiene (2) und der jeweiligen zweiten Tragschiene (3) verfahren werden.

14. Drehgestell (100) nach Anspruch 12 oder 13, wobei die Hebeeinrichtungen einen ersten Betätigungsmechanismus und einen zweiten Betätigungsmechanismus zum Betätigen des ersten Schwenkarms (251) und des jeweiligen zweiten Schwenkarms (252) umfassen, um diese zwischen der eingezogenen Position und der ausgefahrenen Position zu bewegen, wobei der erste und der zweite Betätigungsmechanismus jeweils mindestens Folgendes umfassen:

- einen Betätigungskolben (260), der mit dem jeweiligen ersten oder dem jeweiligen zweiten Schwenkarm (251, 252) verbunden ist;
- einen Verriegelungs-/Entriegelungshebel (263), der an dem Querträger (30) angelenkt ist, von dem jeweiligen ersten oder zweiten Schwenkarm (251, 252) beabstandet ist und einen hakenförmigen Abschnitt (264) aufweist, der geeignet ist, um mit einem assoziierten Abschnitt (35) in Eingriff zu kommen/von diesem gelöst zu werden, um den Querträger (30) in der abgesenkten Position zu verriegeln/zu entriegeln; und
- einen Verbindungshebel (265), der den Verriegelungs-/Entriegelungshebel (263) mit dem jeweiligen ersten oder dem jeweiligen zweiten Schwenkarm (251, 252) verbindet,

wobei der Verriegelungs-/Entriegelungshebel (263), der Verbindungshebel (265), der Betätigungskolben (260) von jedem von dem ersten oder dem zweiten Betätigungsmechanismus und der jeweilige erste oder der jeweilige zweite Schwenkarm (251, 252) sich fest miteinander bewegen.

15. Schienenfahrzeug, **dadurch gekennzeichnet, dass** es mindestens ein Drehgestell (100) nach einem oder mehreren der vorherigen Ansprüche umfasst.

Revendications

1. Bogie (100) destiné à un véhicule ferroviaire, comprenant :

- un premier demi-châssis (10) portant un premier jeu de roues (11) et un second demi-châssis (20) portant un second jeu de roues (12), lesdits premier et second demi-châssis (10, 20) étant reliés de manière mobile l'un à l'autre au moins le long d'un premier axe (Y) transversal par rapport à une direction de déplacement (X) du bogie le long d'une ligne ferroviaire (110) ;
- une traverse (30) mobile entre une position abaissée dans laquelle elle repose sur les premier et second demi-châssis (10, 20) et est verrouillée sur ceux-ci, les premier et second demi-

châssis étant à une première distance mutuelle correspondant à un premier écartement des rails, et une position relevée dans laquelle elle est déverrouillée des premier et second demi-châssis (10, 20) et est soulevée au-dessus de ceux-ci ;
- un système de variation d'écartement permettant d'interagir avec une installation de variation d'écartement (1) qui est positionnée le long de la ligne ferroviaire (110) et qui comprend un premier rail de support (2) et un second rail de support (3), et une pluralité de rails de guidage (4, 5, 6, 7) intercalés entre eux ;

caractérisé en ce que ledit système de variation d'écartement (200) comprend au moins des moyens d'actionnement (220) et une pluralité d'éléments guidés mobiles (201, 202, 203, 204), dans lequel le mouvement de la traverse (30) de la position abaissée à la position relevée déclenche lesdits moyens d'actionnement qui actionnent ensuite ladite pluralité d'éléments guidés mobiles pour passer d'une position de repos à une position de travail dans laquelle chaque élément guidé coulisse dans, et est guidé par, un rail de guidage correspondant parmi ladite pluralité de rails de guidage (4, 5, 6, 7), le coulissement guidé de la pluralité d'éléments guidés mobiles à l'intérieur des rails de guidage correspondants provoquant le déplacement d'au moins l'un des premier et second demi-châssis (10, 20) le long dudit premier axe (Y) transversal par rapport à la direction de déplacement (X) jusqu'à atteindre une seconde distance mutuelle entre les premier et second demi-châssis correspondant à un second écartement des rails.

2. Bogie (100) selon la revendication 1, dans lequel, en se référant audit premier axe (Y) transversal par rapport à la direction de déplacement (X), chaque élément de guidage mobile (201, 202, 203, 204) est positionné et passe de la position de repos à la position de travail en restant dans l'espace défini entre le premier jeu de roues (11) et le second jeu de roues (12).

3. Bogie (100) selon la revendication 1 ou 2, dans lequel lesdits moyens d'actionnement sont des moyens d'actionnement hydraulique (220) et comprennent au moins un premier élément élastique (221) qui est déclenché par le passage de la traverse (30) de la position abaissée à la position relevée pour provoquer l'application d'une pression hydraulique permettant de faire passer au moins un premier sous-ensemble de ladite pluralité d'éléments guidés mobiles (201, 202, 203, 204) de la position de repos à la position de travail.

4. Bogie (100) selon la revendication 3, dans lequel lesdits moyens d'actionnement hydraulique (220) comprennent au moins un premier récipient hydraulique (225) contenant un liquide et ledit au moins un premier élément élastique (221) comprend un premier ressort (221) logé à l'intérieur du premier récipient hydraulique (225) et conçu pour passer d'une position pré-comprimée lorsque la traverse (30) est dans ladite position abaissée, à une position déployée lorsque la traverse (30) est dans ladite position relevée, provoquant ainsi, au moyen dudit liquide, l'application de ladite pression hydraulique permettant de faire passer ledit au moins un premier sous-ensemble de la pluralité d'éléments guidés mobiles (201, 202, 203, 204) de la position de repos à la position de travail.

5. Bogie (100) selon la revendication 4, dans lequel lesdits moyens d'actionnement hydraulique (220) comprennent un second élément élastique (222) qui est déclenché par le passage de la traverse (30) de la position abaissée à la position relevée pour provoquer l'application d'une pression hydraulique permettant de faire passer au moins un second sous-ensemble de la pluralité d'éléments guidés mobiles (201, 202, 203, 204) de la position de repos à la position de travail.

6. Bogie (100) selon une ou plusieurs des revendications précédentes, dans lequel ladite pluralité d'éléments guidés mobiles comprend au moins un premier pivot (201) et un deuxième pivot associé (202) qui sont montés dans un premier cylindre de logement (211) et dans un deuxième cylindre de logement correspondant (212), mobiles le long d'un second axe (Z) transversal par rapport audit premier axe (Y) et à ladite direction de déplacement (X) entre ladite position de repos, où ils sont chacun au moins partiellement rétractés à l'intérieur des premier et deuxième cylindres de logement respectifs (211, 212), et ladite position de travail où ils sont chacun au moins partiellement extraits en dehors des premier et deuxième cylindres de logement respectifs (211, 212) et entrent dans un premier rail de guidage (4) et un deuxième rail de guidage respectif (5) de l'installation (1).

7. Bogie (100) selon la revendication 6, dans lequel ladite pluralité d'éléments guidés mobiles comprend en outre un troisième pivot (203) et un quatrième pivot associé (204) qui sont montés dans un troisième cylindre de logement (213) et dans un quatrième cylindre de logement correspondant (214), mobiles le long dudit second axe (Z) transversal par rapport audit premier axe (Y) et à ladite direction de déplacement (X) entre ladite position de repos, où ils sont chacun au moins partiellement rétractés à l'intérieur des troisième et quatrième cylindres de logement respectifs (213, 214), et ladite position de travail, où ils sont chacun au moins partiellement extraits en

dehors des premier et deuxième cylindres de logement respectifs (213, 214) et entrent dans un troisième rail de guidage (6) et un quatrième rail de guidage respectif (7) de l'installation (1).

8. Bogie (100) selon les revendications 4 et 7, dans lequel ledit premier récipient hydraulique (225) est relié hydrauliquement auxdits premier et troisième cylindres de logement (211, 213) de sorte que lorsque ledit premier ressort (221) passe de la position pré-comprimée à la position déployée, il provoque l'application d'une pression hydraulique permettant de faire passer au moins lesdits premier et troisième pivots (201, 203) de leur position de repos à leur position de travail.

9. Bogie (100) selon la revendication 5, dans lequel lesdits moyens d'actionnement hydraulique (220) comprennent un second récipient hydraulique (226) contenant un liquide et ledit au moins un second élément élastique (221) comprend un second ressort (222) logé à l'intérieur du second récipient hydraulique (226) et conçu pour passer d'une position pré-comprimée lorsque la traverse (30) est dans ladite position abaissée, à une position déployée lorsque la traverse (30) passe dans ladite position relevée, provoquant ainsi, au moyen dudit liquide, l'application de ladite pression hydraulique permettant de faire passer au moins ledit second sous-ensemble de la pluralité d'éléments guidés mobiles (201, 202, 203, 204) de la position de repos à la position de travail.

10. Bogie (100) selon la revendication 7, comprenant une première barre télescopique (15) et une seconde barre télescopique (25) qui relient entre eux, le long du premier axe (Y), lesdits premier et second demi-châssis (10, 20) au niveau d'une partie avant et au niveau d'une partie arrière respective du bogie, et dans lequel lesdits premier et deuxième cylindres de logement (211, 212) sont montés le long de la première barre télescopique (15) espacés l'un de l'autre selon une première distance, et lesdits troisième et quatrième cylindres de logement (213, 214) sont montés le long de la seconde barre télescopique (25), espacés l'un de l'autre selon une seconde distance différente de ladite première distance.

11. Bogie (100) selon une ou plusieurs des revendications précédentes, dans lequel ledit système de variation d'écartement (200) comprend en outre des moyens de levage qui sont conçus pour interagir mécaniquement avec l'installation de variation d'écartement (1) et provoquer le passage de ladite traverse (30) de la position abaissée à la position relevée.

12. Bogie (100) selon la revendication 11, dans lequel lesdits moyens de levage comprennent un premier bras pivotant (251) portant au moins un premier élément d'appui (253) et un second bras pivotant (252) portant au moins un second élément d'appui (254), lesdits premier et second bras pivotants (251, 252) étant articulés à une première extrémité latérale (33) et à une seconde extrémité latérale opposée (33, 34) de la traverse (30), chacun pouvant passer de manière réversible d'une position rétractée vers la traverse (30) à une position extraite éloignée de la traverse (30) où l'au moins un premier élément d'appui (253) est amené à reposer sur le premier rail de support (2) et à se déplacer par rapport à celui-ci, et l'au moins un second élément d'appui (254) est amené à reposer sur le second rail de support (3) de l'installation de variation d'écartement (1) et à se déplacer par rapport à celui-ci.

13. Bogie (100) selon la revendication 12, dans lequel lesdits premier et second bras pivotants (251, 252) sont conçus pour tourner autour dudit au moins un premier axe (Y) transversal par rapport à la direction de déplacement (X) de sorte que ledit au moins un premier élément d'appui (253) et ledit au moins un second élément d'appui (254) restent en contact avec le premier rail de support (2) et le second rail de support respectif (3), notamment lorsque l'au moins un premier élément d'appui (253) et l'au moins un second élément d'appui (254) se déplacent le long d'une partie montante (8) ou d'une partie descendante (9) du premier rail de support (2) et du second rail de support respectif (3).

14. Bogie (100) selon la revendication 12 ou 13, dans lequel lesdits moyens de levage comprennent un premier mécanisme d'actionnement et un second mécanisme d'actionnement permettant d'actionner ledit premier bras pivotant (251) et le second bras pivotant respectif (252) pour passer de ladite position rétractée à ladite position extraite, lesdits premier et second mécanismes d'actionnement comprenant chacun au moins :

- un piston d'actionnement (260) relié au premier ou au second bras pivotant respectif (251, 252) ;
- un levier de verrouillage/déverrouillage (263) qui est articulé sur la traverse (30), espacée du premier ou du second bras pivotant respectif (251, 252), et qui comprend une partie crochetée (264) permettant de venir en/hors prise avec une partie associée (35) afin de verrouiller/déverrouiller la traverse (30) de ladite position abaissée ; et
- un levier d'interconnexion (265) qui relie entre eux le levier de verrouillage/déverrouillage (263) au premier ou au second bras pivotant respectif (251, 252),

dans lequel le levier de verrouillage/déverrouillage

(263), le levier d'interconnexion (265), le piston d'actionnement (260) de chacun parmi le premier ou le second mécanisme d'actionnement et le premier ou le second bras pivotant respectif (251, 252) se déplaçant de manière solidaire les uns par rapport aux autres.

15. Véhicule ferroviaire **caractérisé en ce qu'**il comprend au moins un bogie (100), selon une ou plusieurs des revendications précédentes.

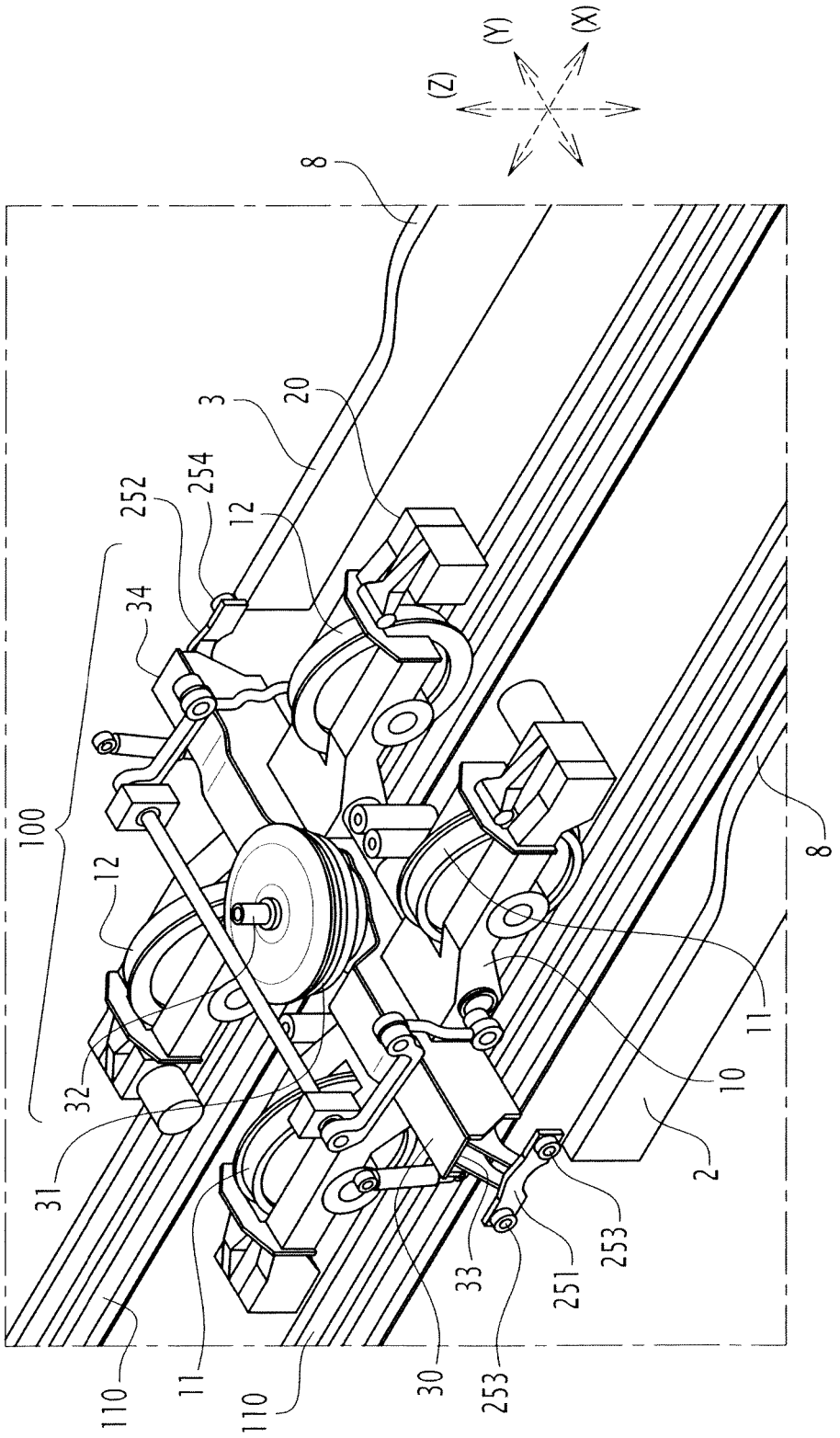
(Z)
(Y)
(X)
8
3
20
252
254
12
34
100
12
32
31
110
11
110
30
253
33
251
253
2
10
11
8

FIG.1

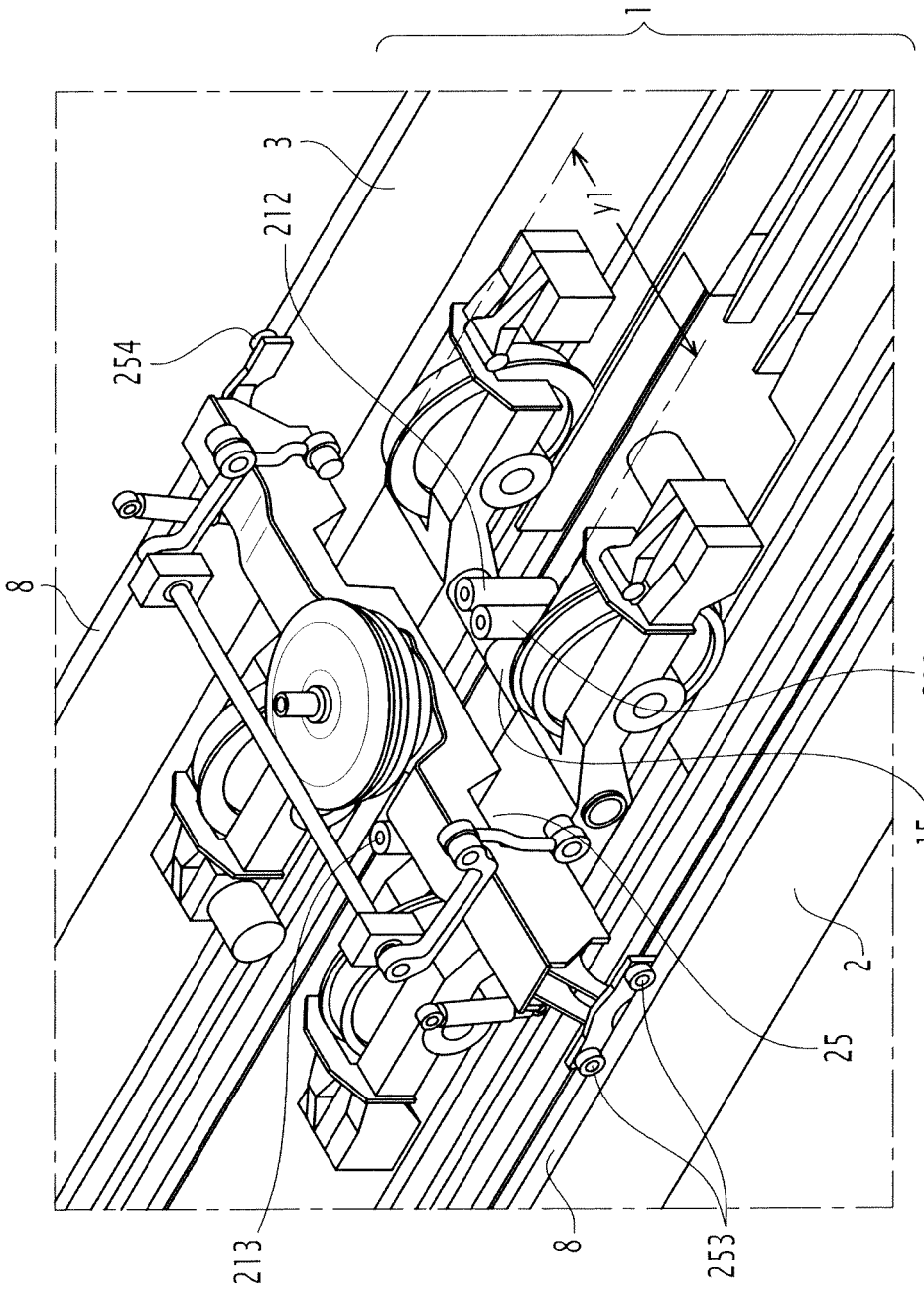

FIG.2

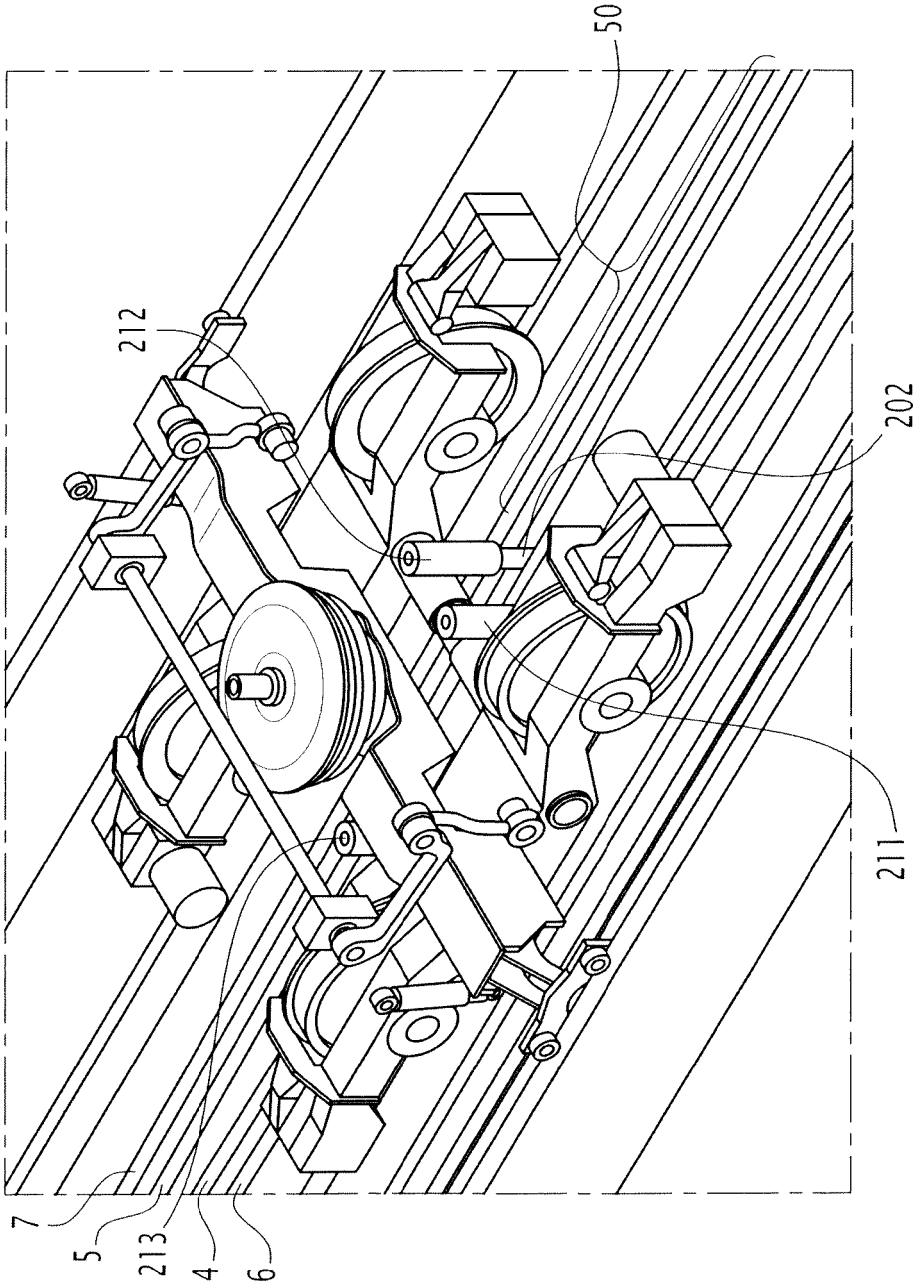

FIG.3

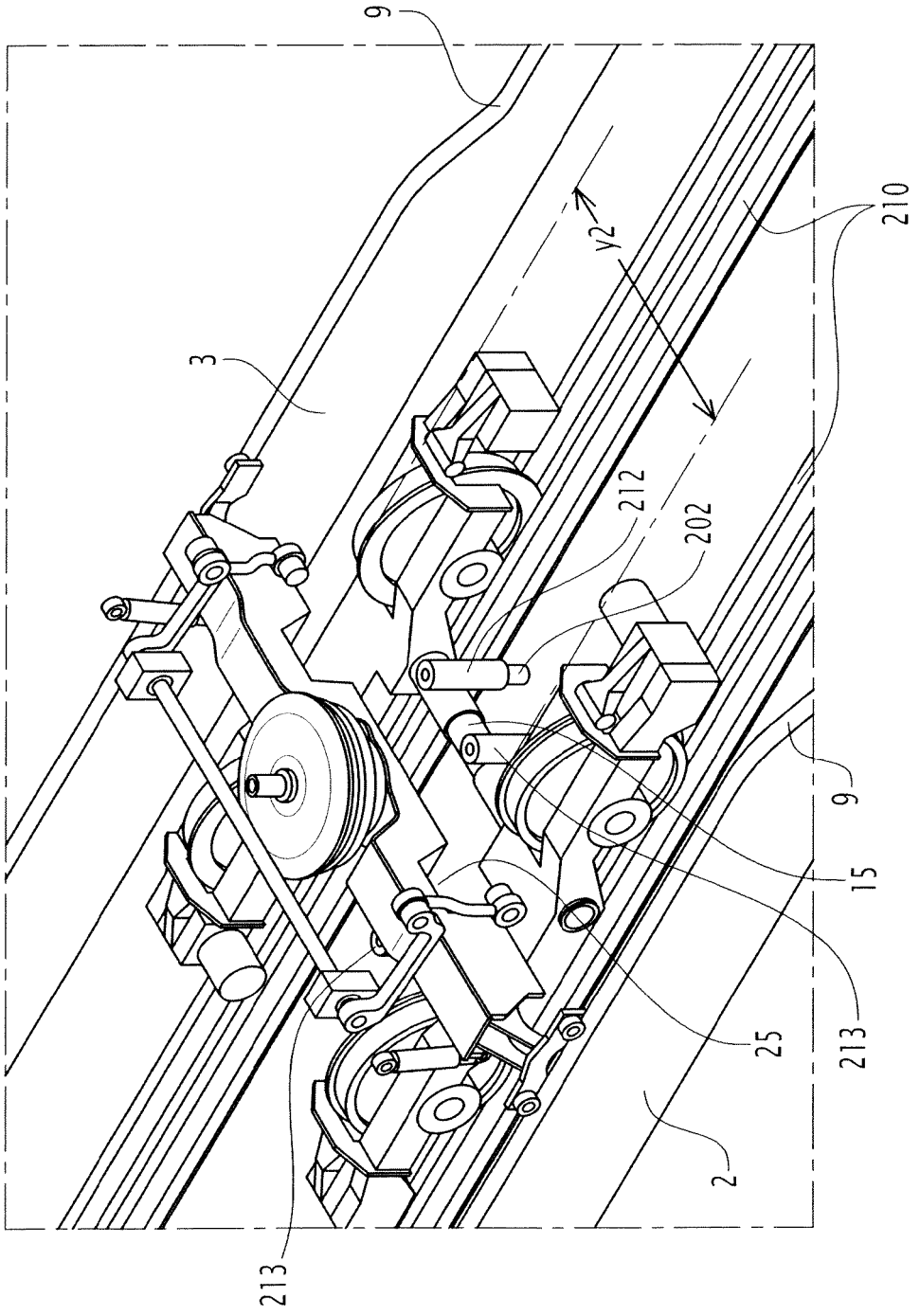

FIG.4

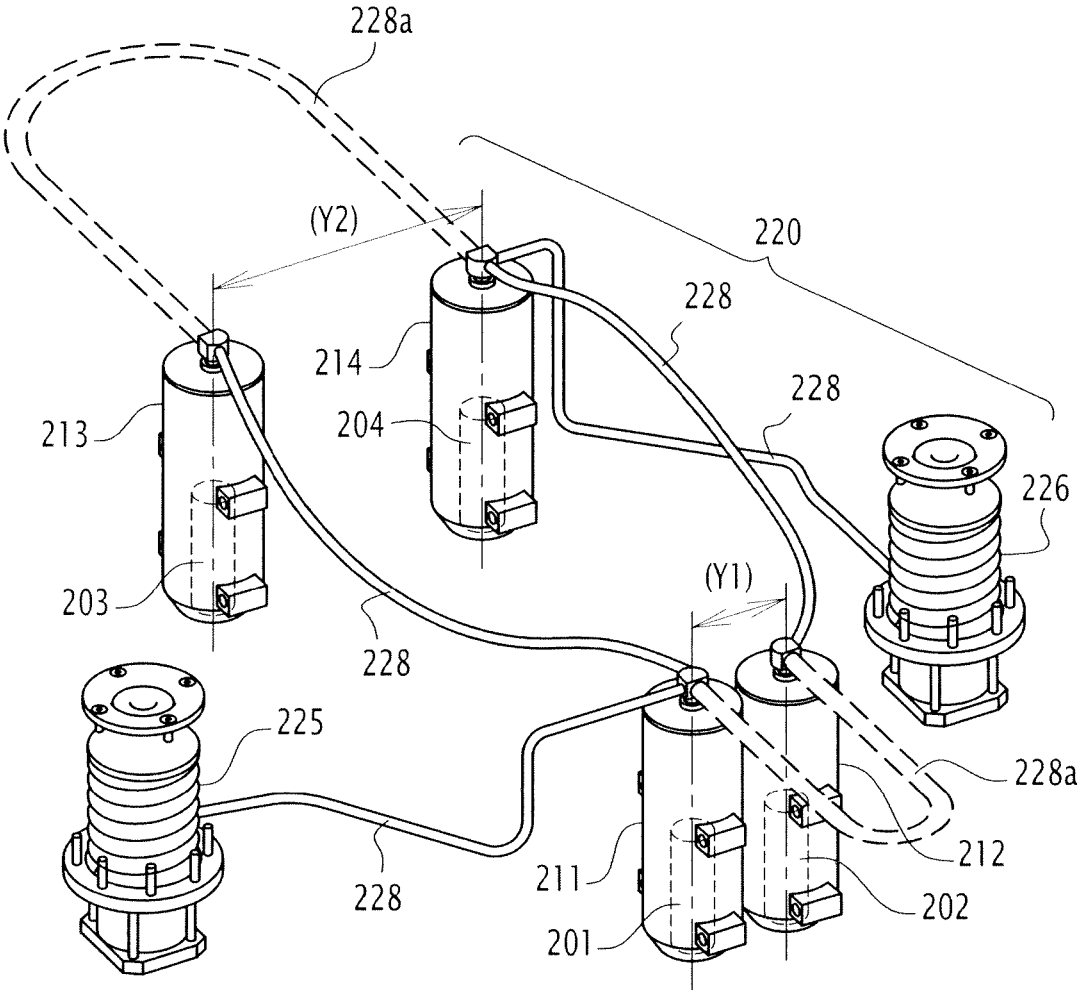
228a
(Y2)
220
228
214
228
213
204
226
(Y1)
203
228
225
228a
212
211
228
202
201

FIG.5

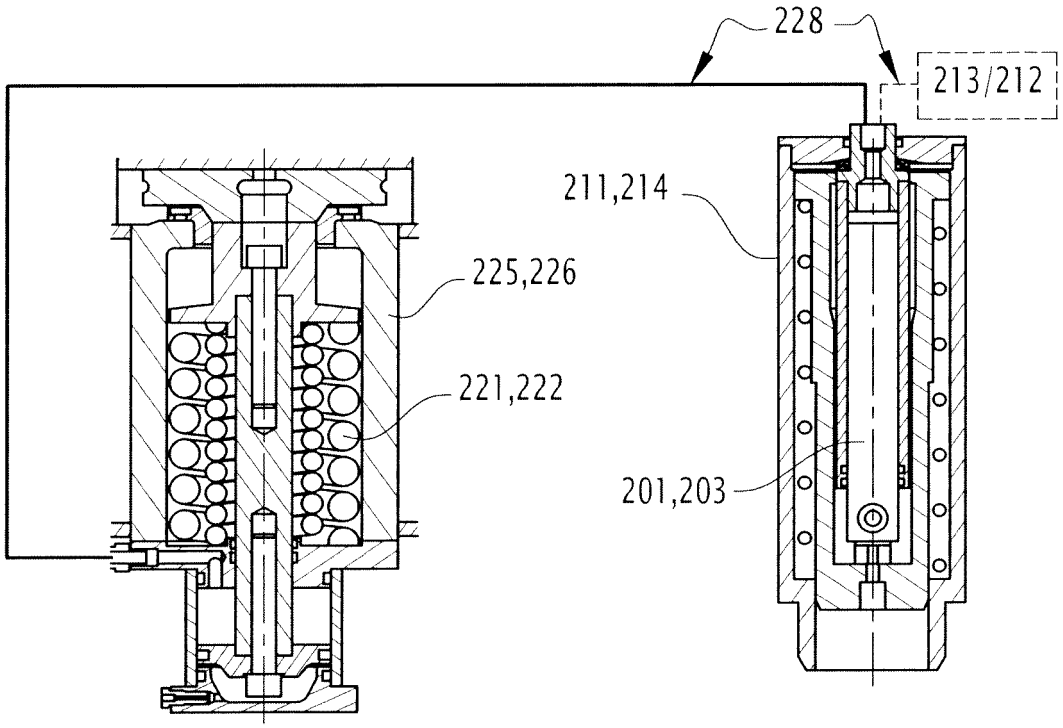

FIG.6

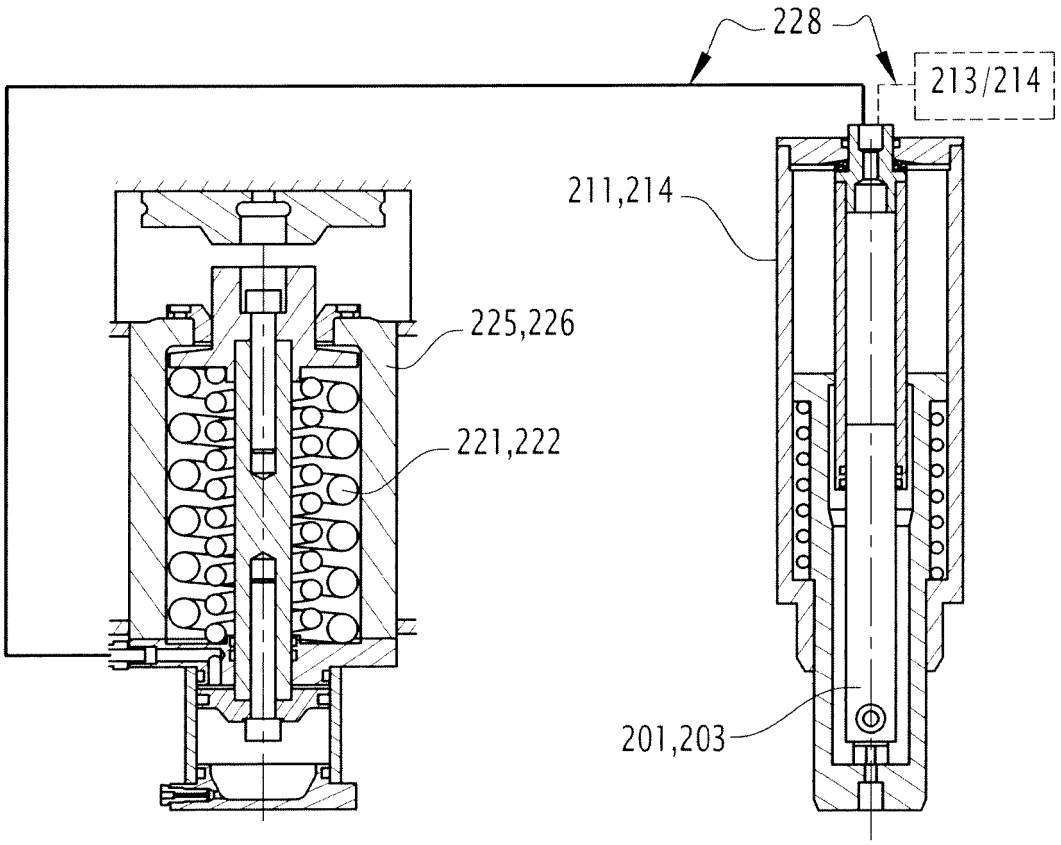

FIG.7

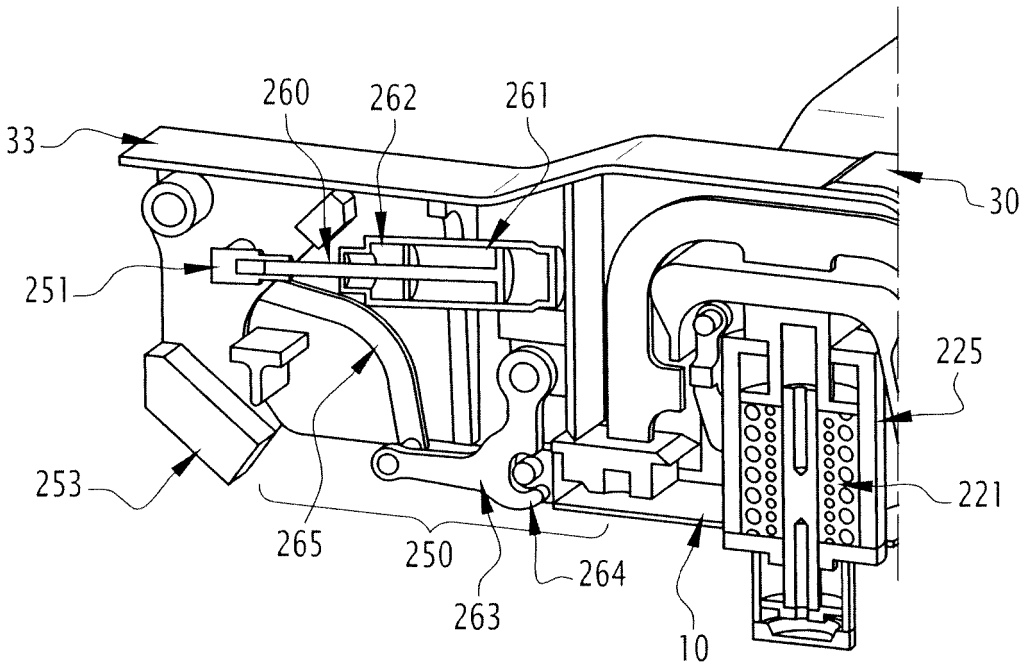

FIG.8

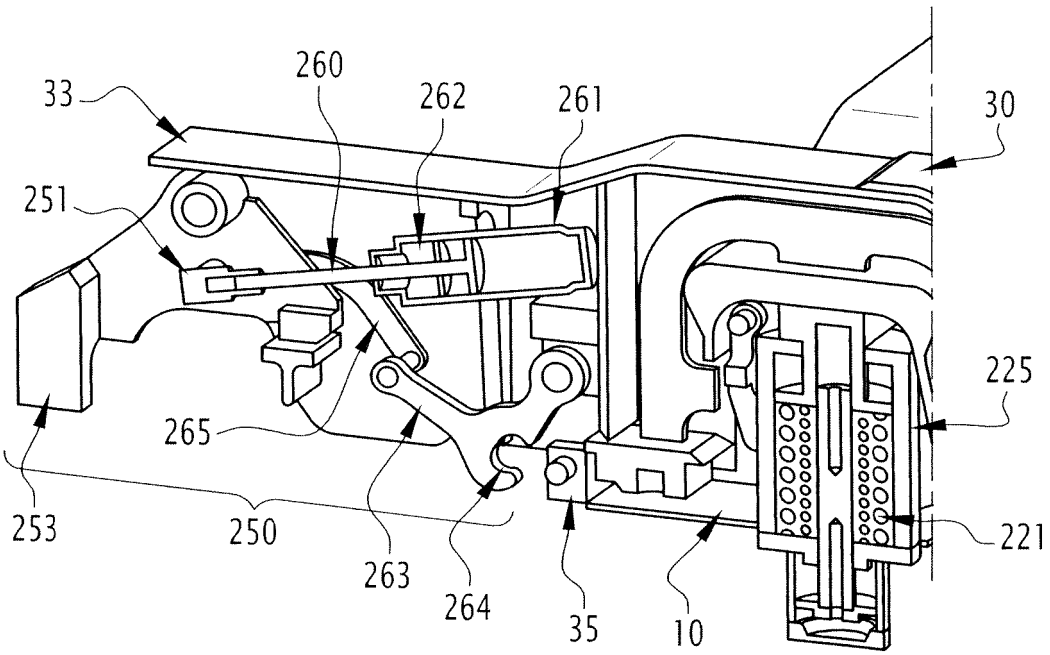

FIG.9

REFERENCES CITED IN THE DESCRIPTION

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