United States Patent [19]

Stöcker

[11] **3,799,062**

[45] **Mar. 26, 1974**

[54] **RAILWAY VEHICLE WITH A GUIDE SWITCHING APPARATUS**

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[22] Filed: **Dec. 4, 1972**

[21] Appl. No.: **311,657**

[30] **Foreign Application Priority Data**

Dec. 23, 1971 Germany 2164042

[52] **U.S. Cl.** **104/105,** 104/130, 104/96

[51] **Int. Cl.** **B61b 3/00**

[58] **Field of Search** 104/130, 96, 88, 105

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[57] **ABSTRACT**

A railway switch system in which rimless guiding wheels of a railway truck are held in one of two limit positions by a toggle mechanism is disclosed herein.

6 Claims, 5 Drawing Figures

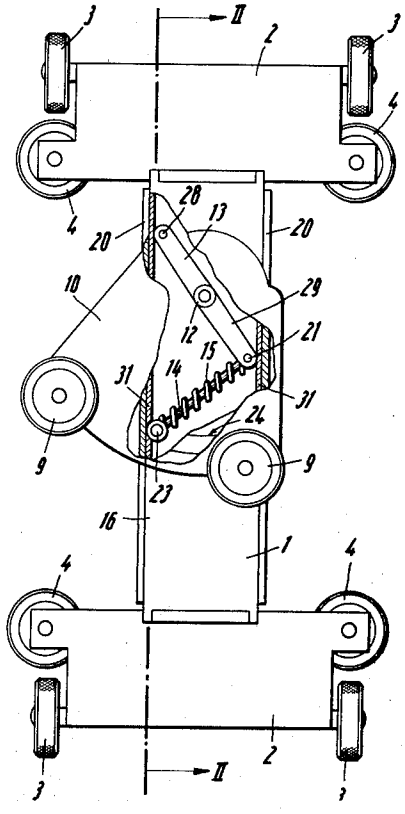

Fig. 1

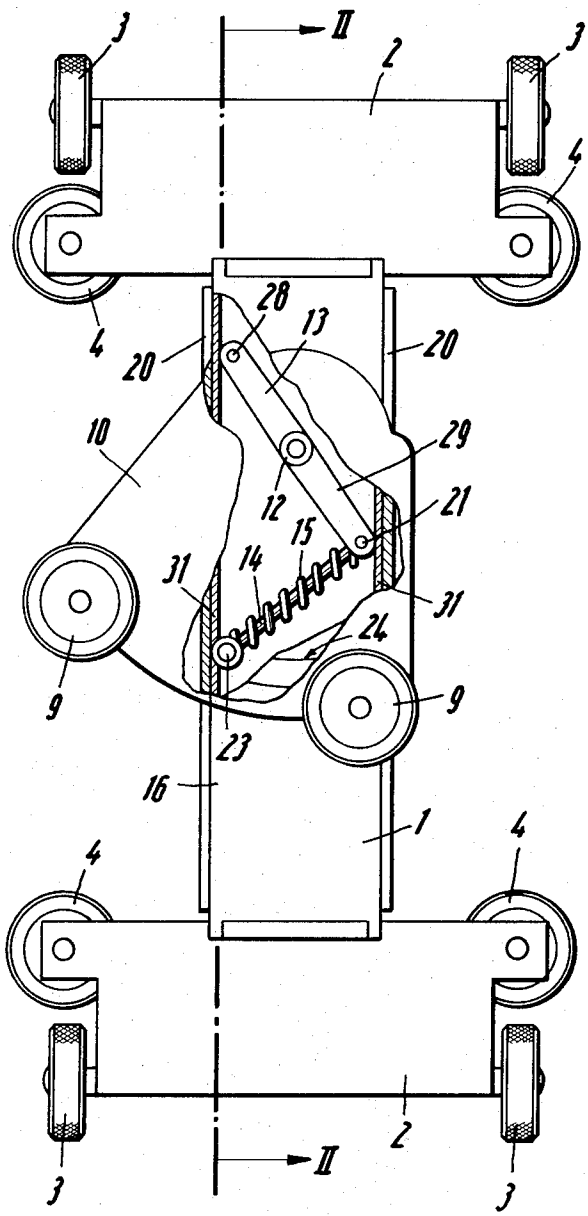
II
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Fig. 2

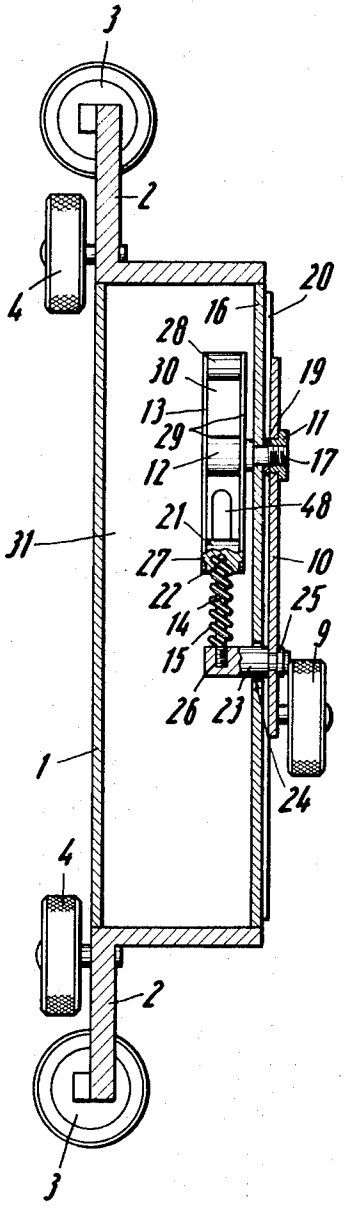
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Fig. 3

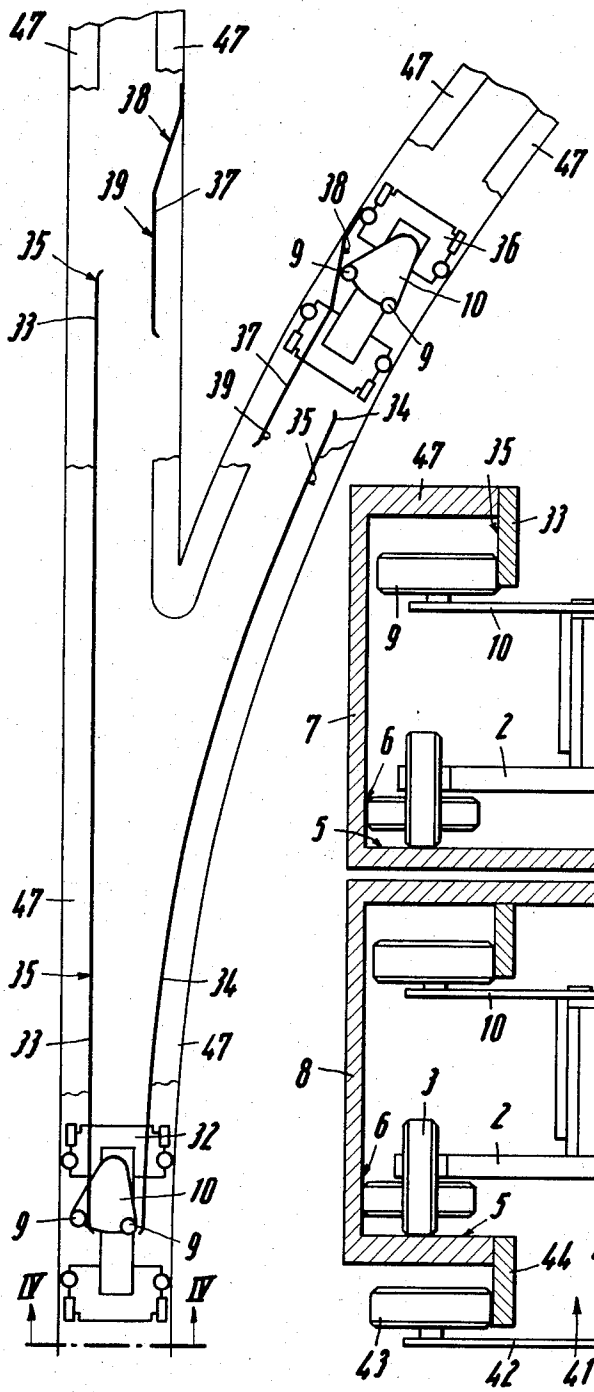

Fig. 4

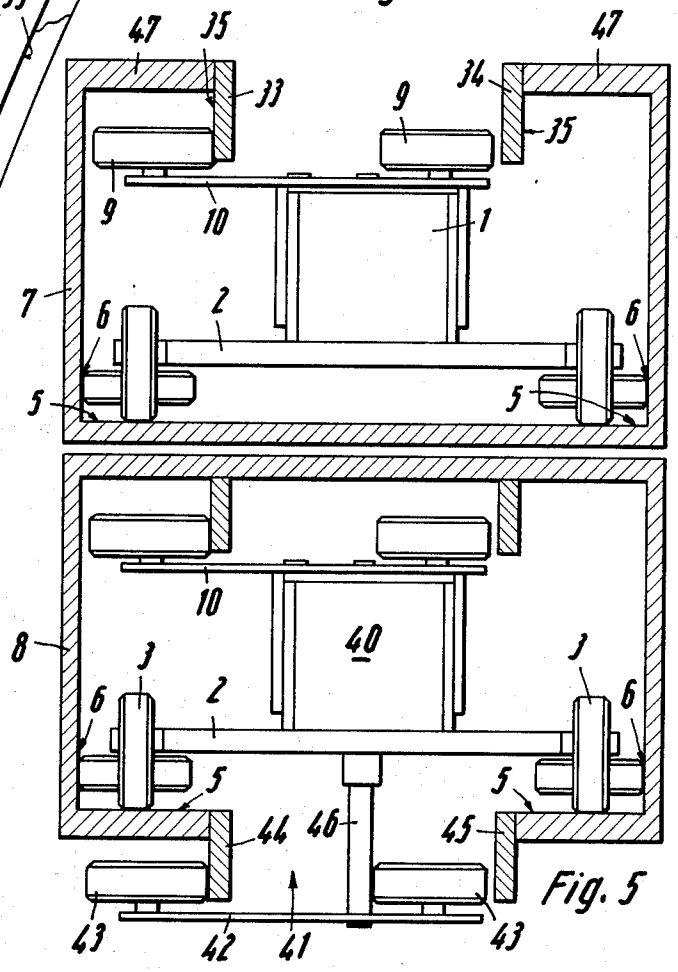

Fig. 5

RAILWAY VEHICLE WITH A GUIDE SWITCHING APPARATUS

BACKGROUND AND SUMMARY OF THE PRESENT INVENTION

Vehicles equipped with rimless or flat wheels are well known and rimless wheels have been used for the guidance and support of railway vehicles. Contrary to conventional rimmed (or flanged) railway wheels which provide both guidance and support, each rimless wheel serves only for guidance or only for support. Thus railway cars have been provided with rimless supporting wheels disposed on horizontal axes and rimless guiding wheels disposed on vertical axes. Such cars, which heretofore have been used with the so-called girder road systems (bottom-supported or suspended railway vehicles), have the important advantage that pneumatic tires may be used as wheels. A considerable advantage of such girder road cars is that they may be directionally switched across railway "switches" without the use of adjustable or moving track parts.

In the practice of the invention, the truck of the railway car is provided with steering wheel pairs for directing the vehicle and with support wheels for conveying the vehicle. At each railway switch there are two guide rails, with outer guide flanges for supporting the steering wheels, which rails extend without interruption over the entire length of the railway switch. As will be understood, one guide rail is provided for the straight direction and one guide rail is provided for the branch line.

The steering wheel pairs are arranged on a supporting device laterally displaceable with respect to the longitudinal axis (the axis of travel) between two limit positions in a manner whereby, in one of its limit positions, one steering wheel contacts the outer guide flange of the guide rail of the straight track line and, in the other limit position, the second steering wheel contacts the outer guide flange of the guide rail of the branch track line. Thus as the vehicle traverses a switch it is guided and supported on one side only and, importantly, the "throw" of the supporting devices for the guide wheels is always set before entry into a "switch." Consequently the ultimate direction of the vehicle is determined before the railway switch. The track switch is "passive" (it has no moving parts) and may be used by several successive vehicles traveling in different directions.

To ensure safe use of the railway switch diverging direction, i.e., from beginning to end of railway switch, such vehicles require that at the beginning of the railway switch their supporting devices are always in one of the two possible limit positions so that the guidance is effected along one of the two guide rails. Likewise, to ensure safe use of the railway switch in merging direction, i.e. from the forked end to the beginning of the railway switch, (there being no determination of direction) the supporting device at the forked end of the switch must be in a specific limit position where it can engage with the respective guide rail. Absent such engagement the (cars) would be without guidance in the center of the railway switch; this of course may result in a collision or, in case of suspended vehicles (railway switches being open at the bottom) may result in a fall of the cars.

The present invention provides the above-mentioned criteria with rather simple means, for bottom-supported as well as for suspended railway cars. In the following description, the word "wheel" includes all rolling bodies moving around an axis, such as rollers, etc.

In accordance with the present invention, a passive railway "switch" is provided in which the direction is determined by at least one stationary guide rail having outer guide flanges for either the right or the left side of a railway car equipped with rimless guide wheels. Each car has at least one supporting device adjustable between two limit positions, each corresponding to points of contact with two guide rails. Only one guide wheel at a time (of the supporting device) contacts one or the other of the two guide rails in each limit position. Advantageously, the supporting device may be pivoted around a vertical axis by means of a switching device operating in the fashion of a toggle switch. Thus the supporting device is constantly maintained in one of its limit positions and may be moved to the other limit position by means of an internal (within the vehicle) switching device or by means of external (without the vehicle) steering rails disposed opposite the guide rails of the railway switch.

This insures that the car will always be guided along a guide rail at railway switches, regardless of whether the railway switch is to be traversed in diverging or in merging directions. In the latter case, if the supporting device is located at the improper limit position, it will be moved to the correct limit position by means of the external steering rails. This only requires the arrangement of one steering rail at the railway switch ends with a contact surface and following inner guide flanges opposite each guide rail, so that upon contact of one of the guide wheels of the supporting device, the supporting device will be brought into the limit position where its other guide wheel can rest on the outer guide flange of the respective guide rail. Before passing the railway switches in diverging directions it is not necessary to move the supporting device by means of an external switch.

The switch mechanism may essentially consist of a bilateral positioning lever, preferably swiveling around the support axis of the supporting device between two limit positions, and a toggle lever, which is connected with one of the ends of the positioning lever. The positioning lever is pivotably connected with the supporting device and is also axially displaceable against spring pressure. With the new switch mechanism it is possible, before or while traversing a railway switch in the merging direction, to set the direction for a subsequent railway switch. The connection chosen between toggle lever and positioning lever does not allow for changing the positioning lever with the toggle lever or the supporting device (i.e., it cannot be internally set) if the supporting device is brought into a limit position by a steering rail which limit position does not correspond to the limit position to be taken before the next railway switch and which had been pre-set by the set lever. In such a case the supporting device achieves only a tilting of the toggle lever with axial displacement against spring pressure. The supporting device is automatically returned into the pre-set proper limit position by this spring pressure as soon as it is released by the guide rail provided for the steering rail. This way it is possible to

pass railway switches arranged in immediate succession (junctions, etc.) at high speed.

For a more complete understanding of the invention and a better appreciation of its attendant advantages, reference should be made to the following detailed description taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a railway vehicle car provided with rimless supporting and guide wheels, with parts broken away for purposes of more clearly illustrating the invention;

FIG. 2 is a cross-sectional view of the vehicle of FIG. 1 taken along line II—II thereof;

FIG. 3 is a plan view of an open top girder track in a railway switch area showing the vehicles at the beginning and at the end of switch;

FIG. 4 is an enlarged cross-sectional view of an open top girder track, with a bottom-supported vehicle, taken along line IV—IV of FIG. 3;

FIG. 5 is an enlarged cross-sectional view of an open bottom track with a top supported, suspended vehicle.

DETAILED DESCRIPTION OF THE INVENTION

A railway truck shown in FIGS. 1 and 2 of a railway car not further illustrated or described consists essentially of a box-shaped body 1 having two wheel supports 2 for rimless wheels (e.g. rubber tires or the like). Each wheel support 2 has two supporting wheels 3 mounted for rotation about a horizontal axis and two guide wheels 4 mounted for rotation about a vertical axis. The wheels 3, 4 support and guide the railway car on horizontal support surfaces 5 and vertical inner guide flanges 6, respectively, of tracks 7 and 8 (FIGS. 4 and 5, respectively) which are either open at the top (FIG. 4) or at the bottom (FIG. 5) according to the arrangement of a railway car (not shown) to be connected to the truck. As shown in FIGS. 1 and 2, the truck body 1 is suitable for bottom-supported vehicles, when the car rests on wheel supports 2, and is also suitable for suspended vehicles, when the car is attached to the body 1.

As shown in FIGS. 1 and 2, there are two additional guide wheels 9 located above body 1, on a common, plate-like supporting device 10 (shown on FIG. 1 with parts broken away), which pivots about a vertical hollow bolt 11 (with collar) between two limit positions. The device 10 is constantly maintained in one of its limit positions. A switch mechanism provided in body 1, which mechanism consists of a positioning lever 13 pivoting around a bed bolt 12 (coaxial with the hollow bolt 11) between two limit positions, and a toggle lever 14 with coil spring 15. Bolts 11 and 12 are firmly supported in body 1 and its cover plate 16, respectively as shown in FIG. 2. The end of bed bolt 12 passing through cover plate 16 tapers gradually and has threads 17 so that it rests at the cover and may be threaded to the hollow bolt 11, which is provided with a continuous female thread. In order to make sure that this connection does not impair the mobility of the device 10, a spacing washer 19 is inserted between hollow bolt 11 and the cover 16. Two bearing plates 20 are attached laterally to the body 1 to reinforce the supporting device 10; they may be made or coated with a suitable plastic having good antifriction properties.

One end of the toggle lever 14 is connected with the lever 13 and the other end is connected with the supporting device 10. The connection with the set lever 13 is made by a guide bolt 21 which is pivoted in the lever 13, which lever has a radial bore 22. The toggle lever 14 is axially displaceable in the bore 22 and is connected with supporting device 10 by a stop bolt 23 pivoted in the supporting device 10, which bolt 23 projects through an arcuate opening 24 in the cover 16. A screw connection 26 secures the toggle lever 14 to the stop bolt 23, which itself is restrained in the axial direction by a safety washer 25. Advantageously, the bed bolt 12 and the guide bolt 21 are provided with peg-shaped ends 27 which may be connected with the set lever 13 during manufacture. This is also true for the bolt 28 which is pivoted at the free end of the lever 13, which bolt 28 may serve to mount an adjusting device not shown here (e.g. an adjusting motor with lever gear or the like). In view of the simple mounting of these bolts 12, 21 and 28, the set lever 13 consists of a pair of parallel lever plate elements 29, which are connected with each other through a spacer 30 by screw connections or the like.

With the new switch mechanism a coil spring 15, acting between guide and stop bolts 21 and 23 respectively, ensures that the set lever 13, and the supporting device 10 are constantly maintained in one or the other of their two limit positions. Stop lever 23 and the free end of the lever 13 (bolt 28) rest on the same lateral surface 31 of the body 1. The end of the set lever provided with guide bolt 21 rests on the opposite lateral surface. As will be understood, the ends of the lever 13 determine its limit position. Of course, only one end, i.e. its free end, would have to be provided for. In the present case both lateral surfaces 31 and the bearing plates 21 have horizontal slots 48 at the level of the toggle lever 14, in order to facilitate, in each limit position of the lever 13, the axial displacement of the toggle lever through lateral surfaces 31. If supporting device 10 is to be brought from the left limit position shown on FIG. 1 to the other (right) limit position, it is only necessary to shift the lever 13 accordingly. This will initially cause the toggle lever 14 (which will be axially displaced against pressure of coil spring 15) to move into dead center and then, upon passing this dead center, the coil spring 15 will snap the supporting device 10 towards the right limit position. The return of the device 10 from right to left is effected in a similar manner as should be understood.

One considerable advantage of this switch mechanism is that supporting device 10 may be brought from the left limit position to the right limit position by means of its left guide wheel 9 without moving the lever 13 from its left limit position. Only the toggle lever 14 need be moved, in a fashion whereby it is axially displaced against the pressure of coil spring 15. When the left guide wheel 9 is released, the supporting device 10 is automatically returned to the left limit position set by the lever 13 by means of the coil spring 15. In the same manner, the supporting device 10 may be moved from the right position (not shown) to the left limit position through its right guide wheel 9 against the effect of the switch mechanism. The advantages resulting from this for the guidance of a railway car are further explained hereinafter.

When traversing a railway switch (FIG. 3) in the diverging direction, the direction of the railway truck

(and its car) is determined by guide wheels **9** of the supporting device **10.** For this purpose, depending on the direction desired, either the left guide wheel **9** rests on the guide rail **33** provided for the left side of the car (for straight passage) at the beginning of the railway switch (position of car **32**), or the right guide wheel **9** rests on guide rail **34** provided for the right side of the vehicle (for the branch line). In either case contact is on the outer guide flange **35** or the corresponding guide rail. It is merely necessary to bring the supporting device **10** initially into the corresponding limit position by means of the switch mechanism. FIG. **4** shows, for example, a car in accordance with FIG. **1** with its supporting device **10** in the left limit position. In order to show this also in FIG. **3** (at the beginning of the railway switch), supporting girders **47** for guide rails **33** and **34** are shown with parts broken away. Even in case of a failure in the setting, e.g. failure of a switch not shown, which is coupled with the lever **13** (FIGS. **1** and **2**), the switch mechanism ensures that the vehicle is guided along one of the guide rails **33** or **34.** As already mentioned, supporting device **10** is always kept in one of its limit positions. Forces in the guide wheel **9** pass directly to the body through the supporting device **10** and the stop bolt **23**; the rest of the switch mechanism is not involved in this action. If a railway switch (FIG. **3**) is to be traversed in the merging direction, it is necessary to set a direction at the railway switch end (position of carriage **36**). Accordingly the supporting device must be in a predetermined limit position (only one guide rail **33** or **34** is provided for each branch line). This is achieved, as shown in FIG. **3,** by steering rails **37** having inner bearing surfaces **38** and following inner guide flange **39.** At the end of the railway switch there is one such steering rail **37** arranged opposite each guide rail **33** and **34** so that, upon contact with one of the guide wheels **9** of the supporting device **10,** the latter is brought into that limit position in which the second guide wheel **9** of the supporting device **10** contacts the outer guide flange **35** of the proper guide rail. Therefore, it does not matter which limit position the supporting device **10** is in before the railway switch is traversed in the merging direction. The supporting device **10,** in case of wrong limit position, will be displaced by the steering rail **37** against the pressure of the coil spring **15** (FIGS. **1** and **2**) of the switch mechanism, and automatically will be returned to the limit position determined by the lever **13** after the railway switch has been traversed. Accordingly, while traversing a railway switch, the direction of the next railway switch to be passed in the merging direction may already be preset. This facilitates the construction of junctions, switch mechanisms in railway stations, and other short over-all lengths.

In the center of the railway switch, the supporting wheels **3** of one side of the truck of a suspended car cannot, by necessity, fulfill their function of support, i.e., the vehicle is only supported on the right or on the left side. For example, when choosing direction according to FIG. **5** for a truck **40** (supporting device **10** in the left limit position), the right supporting wheels **3** of the truck are positioned over the opening **41** of the supporting beam **8** in the center of the railway switch. The directive (left) guide wheel **9** then has dual functions, guiding as well as supporting. In order to be able to pass railway switches with small radius at high speed without risk of tilting the car in the case of such one-sided support, there is a further supporting device **42** provided with guide wheels **43** underneath truck **40** and supporting beam **8** accordingly has additional guide tracks **44** and **45.** Thus supporting device **42** is equivalent to the one already mentioned (upper supporting device **2**) and the two are rigidly connected by means of a shaft **46** going through the body. The shaft **46** may be arranged axially and radially in the usual manner in body **1.** It is advantageous to arrange the lever **13** described in FIGS. **1** and **2** pivoted on a bolt. When moving the upper supporting device **10,** the lower one is moved simultaneously and in the same direction so that direction in the railway switch is determined by both guide wheels **9** and **43.** This additional directive and, if need be (in the center of the railway switch) supporting guide wheel **43** considerably increases the security of the vehicle against undue swaying.

It is understood that the use of two supporting devices **10** and **42** with guide wheels **9** and **43** respectively is not limited to railway switches with small radius. Sway-resistance of suspended vehicles may be increased also in narrow curves of the tracks simply by adding guide rails (with outer guide flange). The latter is also true for bottom-supported vehicles, whereby their carriages would suitably have two upper supporting devices with guide wheels for reasons of load distribution. These may be arranged in such a fashion that in railway switches or curves one guide wheel (**9**) each can go over a front or back lower wheel (**4**) of wheel supports (**2**). Furthermore the guide wheels of the supporting device may be equipped with further guide wheels or possibly guide rollers, bolts, slides or similar, which can take over in case of rupture or failure of the corresponding guide wheel.

The cars may be driven by a linear motor, whereby such motor should have double translators arranged on both sides of the car body and stators attached to the lateral walls of tracks. In the center of a railway switch only one side of the track is driven, however, it is also possible to use driving motors for wheel propulsion. In the latter case, the supporting wheels also function as driving wheels.

I claim:

1. A railway vehicle having rimless wheels, the direction of which vehicle is determined by contact with one of two stationary guide rails having outer guide flanges optionally provided for either the right or the left side of the vehicle, said vehicle including at least one supporting device mounting a pair of guide wheels adjustable between two limit positions, in each of said limit positions one of said guide wheels contacts one of the guide rails, means for mounting said supporting device for pivotal movement about a vertical axis, adjusting means comprising a plurality of levers operating in the nature of a toggle switch for pivoting said supporting deivce; at least one of said plurality of levers being displaceable relative to an adjacent one of said plurality of levers; biasing means maintaining said adjusting means in one of said two limit positions; said adjusting means being movable to said limit positions by means carried by said vehicle or by means of steering rails disposed opposite to said guide rails.

2. A railway vehicle according to claim **1,** characterized by the fact that the adjusting means comprises a two-armed set lever pivoting about the axis of the supporting device between said two limit positions and a single-armed toggle lever connected with one of the

ends of the set lever; said connection accommodating pivotal as well as axially displaceable movement against said biasing means.

3. A railway vehicle according to claim **1**, including said guide rails and steering rails disposed in a forked switch characterized by the fact that the steering rails include a contact surface and inner guide flange arranged at the ends of the railway switch opposite each guide rail in a manner whereby contact of one of said guide wheels of the supporting device is brought into the limit position where its second guide wheel rests on the outer guide flange of the respective guide rail.

4. A railway vehicle according to claim **2**, characterized by the fact that the connection between said toggle lever and said supporting device is made by a stop bolt pivoted in said supporting device, said stop bolt determining the limit positions of said supporting device.

5. A railway vehicle according to claim **4**, characterized by the fact that said biasing means is a pressure spring supported on one side by said stop bolt and on the other side by a guide bolt carried by the set lever.

6. A railway vehicle according to claim **5**, characterized by the fact that at least one end of the set lever determines both its limit positions.

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