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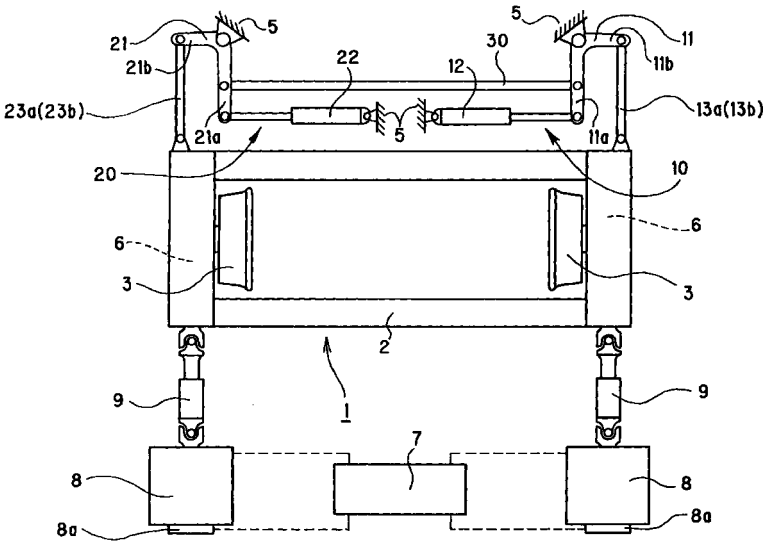
(54) Single axle and independent wheels bogie for a railway vehicle

(57) A single axle bogie (1) with independent wheels (3) has a bogie frame (2) provided with a pair of wheels independently drive by individual main motors (8). The motor speeds of the main motors are controlled to be equal. Between a vehicle body (5) and the bogie frame (2), a damper mechanism (10) comprising a lever (11), a damper (12) and side rods (13a,13b) is installed to restrain a turning motion of the bogie (1). Between the vehicle body and the bogie frame, a centering mechanism (20) comprising a lever (21), a centering device (22) and side rods (23a,23b) is installed to return the bogie (1) to a neutral position. Thus, hunting (yawing oscillations) during a high speed run is suppressed to achieve a stable run.

Fig.1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a one-axis independent wheel bogie for a railway vehicle. This invention is designed to suppress a zigzag motion (yawing oscillations of the bogie in a horizontal plane) during high speed running, and prevent the bogie from tumbling and turning in a pitching direction relative to a vehicle body. By so doing, the invention is intended to ensure a safe, stable run.

2. Description of the Related Art

[0002] Driving bogies for many railway vehicles in current use employ integral type wheels composed of a right wheel and a left wheel coupled together via an axle. A driving force from a motor installed on the bogie is reduced by a reduction gear, and transmitted to the integral type wheels to make a run. When a run is to be taken on a curved track, a self-steering effect utilizing a slope of a wheel tread of the wheel makes a curved run possible.

[0003] Recently, an independent wheel driving bogie has been developed to adopt a flow floor structure or the like. With this independent wheel driving bogie, an axle is omitted to allow a right wheel and a left wheel to rotate individually and independently, and each wheel is driven by a separate motor.

[0004] Among types of such independent wheel driving bogies, there is a bogie of a type called "a single-axis independent wheel bogie". With this single-axis independent wheel bogie, a pair of wheels (two wheels) are arranged for a single bogie frame, the right wheel and the left wheel rotate individually and independently, and each wheel is driven by a separate motor. The right wheel and the left wheel rotate independently without being coupled together via an axle, but define a single axis as a pair. Thus, this type of bogie is called "a single-axis" independent wheel bogie.

[0005] When such a single-axis independent wheel bogie is to run on a linear track, motor speed control is effected to make the speeds of the right and left wheels equal. By so doing, the turning angle (yawing angle) of the bogie relative to a vehicle body is reduced to zero, so that a run on the linear track can be made. When a run on a curved track is to be made, any of the following methods may be available:

(i) Motor speed control is performed to make the speeds of the right and left wheels equal. At the same time, a self-steering effect is utilized as with the integral type wheels to make a curved run.
(ii) Motor speed control is performed to make the wheel speed of the wheel on an outer track greater than the wheel speed of the wheel on an inner track. This measure generates a turning angle of the bogie relative to the vehicle body, so that a run on a curved track can be made.

[0006] With the single-axis independent wheel bogie, one of the right and left wheels may slip, or become dragged. Or there may a difference in the accuracy of speed control between the motor for driving the right wheel and the motor for driving the left wheel. In such a case, the bogie may turn (make a turning motion), with the turning angle of the bogie relative to the vehicle body exceeding a safety angle set for each of travel locations of the vehicle. When the turning angle of the bogie relative to the vehicle body is within the safety angle, the vehicle can run safely without wheel derailment (a situation in which the flange of the wheel passes over a rail). A turning angle which ensures such a safe run is designated as the "safety angle".

[0007] With a two-axis bogie (a bogie having two wheels arranged on the right side and two wheels arranged on the left side of a single bogie frame, and having two axes), wheel derailment is minimally likely to occur because of a two-axis structure, even if the turning angle of the bogie relative to the vehicle body becomes great to a certain degree. A single-axis independent wheel bogie, by contrast, has a higher possibility, than the two-axis bogie, of a serious derailment accident because of a one-axis structure, if the turning angle of the bogie relative to the vehicle body becomes great to a certain extent.

[0008] Particularly, when it is attempted to make a curved run by the aforementioned method (ii), execution of a safe curved run requires a very high accuracy for motor speed control. Studies by the inventor of the present invention, however, have shown that it is actually difficult to increase the accuracy of motor speed control to a degree to which a safe run can be ensured.

[0009] Under these circumstances, the inventor decided to realize a curved run by employing a technique for a curved run based on the aforementioned method (i). While using this technique, the inventor tried to enhance the running stability of a one-axis independent wheel bogie. In detail, the inventor made efforts to suppress a zigzag motion (yawing oscillations of the bogie in a horizontal plane) during high speed running, and prevent the bogie from tumbling and turning in a pitching direction relative to the vehicle body. Through these measures, the inventor endeavored to ensure a safe, stable run.

SUMMARY OF THE INVENTION

[0010] The present invention has been accomplished in light of the above-described earlier technologies and the results of the technical studies. It is an object of this invention to provide a one-axis independent wheel bogie for a railway vehicle which ensures

more stable running.

[0011] A first aspect of the present invention, as a means of attaining the above object, is a one-axis independent wheel bogie for a railway vehicle, which has a pair of wheels arranged for a single bogie frame, the wheel on a right side and the wheel on a left side being rotatable individually and independently, and which also has motors for driving the right and left wheels individually, the motor speeds of the respective motors being controlled to be equal to each other, the improvement comprising:

a centering mechanism, mounted between a vehicle body and the bogie frame, for imparting a turning force to the bogie frame in a direction in which a turning angle of the bogie frame relative to the vehicle body is reduced to zero, when the bogie frame turns relative to the vehicle body; and
a damper mechanism, mounted between the vehicle body and the bogie frame, for imparting to the bogie frame a restraining force for restraining the bogie frame from turning relative to the vehicle body.

[0012] The centering mechanism may comprise a bent lever having a central portion pivotably attached to the vehicle body, a centering device interposed between one end side of the lever and the vehicle body, and a side rod for providing a connection between the other end side of the lever and the bogie frame.

[0013] Alternatively, the centering mechanism may comprise a bent lever having a central portion pivotably attached to the bogie frame, a centering device interposed between one end side of the lever and the vehicle body, and a side rod for providing a connection between the other end side of the lever and the vehicle body.

[0014] The damper mechanism may comprise a bent lever having a central portion pivotably attached to the vehicle body, a damper interposed between one end side of the lever and the vehicle body, and a side rod for providing a connection between the other end side of the lever and the bogie frame.

[0015] Alternatively, the damper mechanism may comprise a bent lever having a central portion pivotably attached to the bogie frame, a damper interposed between one end side of the lever and the vehicle body, and a side rod for providing a connection between the other end of side the lever and the vehicle body.

[0016] According to the foregoing constitutions of the present invention, the damper mechanism restrains the one-axis independent wheel bogie from turning, and the centering mechanism returns the one-axis independent wheel bogie to a neutral position. Thus, a zigzag motion (yawing oscillations of the bogie) does not occur in the one-axis independent wheel bogie during its high speed run, so that a safe, stable run can be made.

[0017] A second aspect of the present invention is a one-axis independent wheel bogie for a railway vehicle, which has a pair of wheels arranged for a single bogie frame, the wheel on a right side and the wheel on a left side being rotatable individually and independently, and which also has motors for driving the right and left wheels individually, the motor speeds of the respective motors being controlled to be equal to each other, the improvement comprising:

a centering mechanism comprising a first bent lever having a central portion pivotably attached to one of right and left sides of a vehicle body, a centering device interposed between one end side of the first lever and the vehicle body, and an upper side rod and a lower side rod arranged as a pair on the one side of the vehicle body, each of the side rods extending in a direction of advance of the bogie for providing a connection between the other end side of the first lever and the bogie frame;
a damper mechanism comprising a second bent lever having a central portion pivotably attached to the other of the right and left sides of the vehicle body, a damper interposed between one end side of the second lever and the vehicle body, and an upper side rod and a lower side rod arranged as a pair on the other side of the vehicle body, each of the side rods extending in the direction of advance of the bogie for providing a connection between the other end side of the second lever and the bogie frame; and
a connecting rod for connecting the one end side of the first lever and the one end side of the second lever.

[0018] A third aspect of the present invention is a one-axis independent wheel bogie for a railway vehicle, which has a pair of wheels arranged for a single bogie frame, the wheel on a right side and the wheel on a left side being rotatable individually and independently, and which also has motors for driving the right and left wheels individually, the motor speeds of the respective motors being controlled to be equal to each other, the improvement comprising:

a centering mechanism comprising a first bent lever having a central portion pivotably attached to one of right and left sides of a bogie frame, a centering device interposed between one end side of the first lever and a vehicle body, and an upper side rod and a lower side rod arranged as a pair on the one side of the bogie frame, each of the side rods extending in a direction of advance of the bogie for providing a connection between the other end side of the first lever and the vehicle body;
a damper mechanism comprising a second bent lever having a central portion pivotably attached to the other of the right and left sides of the bogie frame, a damper interposed between one end side

of the second lever and the vehicle body, and an upper side rod and a lower side rod arranged as a pair on the other side of the bogie frame, each of the side rods extending in the direction of advance of the bogie for providing a connection between the other end side of the second lever and the vehicle body; and

a connecting rod for connecting the one end side of the first lever and the one end side of the second lever.

[0019] Because of the above constitutions of the present invention, a zigzag motion (yawing oscillations of the bogie) does not occur in the one-axis independent wheel bogie during its high speed run, and a safe, stable run can be made. Furthermore, the side rods of the centering mechanism are arranged at upper and lower positions while extending in the direction of advance of the one-axis independent wheel bogie. Thus, the one-axis independent wheel bogie can be prevented from tumbling and turning in a pitching direction relative to the vehicle body, and can run safely.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The above and other objects, features and advantages of the present invention will become more apparent from the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a plan view showing a one-axis independent wheel bogie for a railway vehicle according to a first embodiment of the present invention;

Fig. 2 is a front view showing the one-axis independent wheel bogie for a railway vehicle according to the first embodiment of the present invention;

Fig. 3 is a perspective view showing a side rod portion of the one-axis independent wheel bogie for a railway vehicle according to the first embodiment of the present invention;

Fig. 4 is a plan view showing a one-axis independent wheel bogie for a railway vehicle according to a second embodiment of the present invention; and

Fig. 5 is a side view showing the one-axis independent wheel bogie for a railway vehicle according to the second embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Embodiments of the present invention will now be described in detail with reference to the accompanying drawings, which in no way limit the invention.

〈First Embodiment〉

[0022] Fig. 1 is a plan view showing a one-axis independent wheel bogie for a railway vehicle according to a first embodiment of the present invention. Fig. 2 is a front view of the one-axis independent wheel. Fig. 3 is a perspective view showing a side rod portion of the one-axis independent wheel bogie.

[0023] As shown in Figs. 1 and 2, right and left wheels 3, 3 rotating individually and independently are arranged on a right side and a left side of a bogie frame 2 of a one-axis independent wheel bogie 1 for a railway vehicle. That is, a pair of the wheels 3, 3 are arranged on the single bogie frame 2. On this one-axis independent wheel bogie 1, a vehicle body 5 is borne via suspension springs 4, 4. The one-axis independent wheel bogie 1 can make a turning motion (yawing motion) in a horizontal plane relative to the vehicle body 5 by a mobile center plate mechanism to be described later on.

[0024] In a right-hand portion and a left-hand portion of the bogie frame 2, reduction gear portions 6, 6 are provided. These reduction gear portions 6, 6 are orthogonal reduction gears such as bevel gears, and have output shafts connected to the wheels 3, 3.

[0025] On the vehicle body 5, a control device 7 and main motors 8, 8 are provided. To the main motors 8, 8, tachometers 8a, 8a for detecting the revolution speeds of the motors are attached. The motor speeds detected by the tachometers 8a, 8a are fed back to the control device 7, which performs motor speed control so that the revolution speeds of both main motors 8, 8 equal.

[0026] Propeller shafts 9, 9 arranged on the right and left connect the main motors 8, 8 with the reduction gear portions 6, 6 to transmit the rotating force of the main motors 8, 8 to the reduction gear portions 6, 6. The propeller shafts 9, 9 are splined in the axial direction to have an axially expansible structure.

[0027] With the foregoing drive system, the control device 7 rotationally drives the main motors 8, 8 at equal speeds, and their rotating force is transmitted to the wheels 3, 3 via the propeller shafts 9, 9 and the reduction gear portions 6, 6, whereupon the wheels 3, 3 rotate and can travel on rails R.

[0028] In a right-hand portion of the one-axis independent wheel bogie 1, a damper mechanism 10 is installed. This damper mechanism 10 is composed of an L-shaped lever 11, a damper 12, and upper and lower side rods 13a and 13b as a pair.

[0029] The lever 11 has a central portion pivotably attached to the right-hand part of the vehicle body 5. The damper 12 is interposed between the vehicle body 5 and one side 11a of the lever 11 while connecting the vehicle body 5 and the one side 11a. The upper and lower side rods 13a and 13b, as shown in Fig. 3 as well, are arranged so as to extend in a direction of advance of the one-axis independent wheel bogie 1, and are interposed between the bogie frame 2 and the other side 11b of the lever 11 while connecting the bogie frame 2 and the other side 11b. Between the side rods 13a, 13b and the bogie frame 2, rubber bushings 14a, 14b are interposed to prevent high frequency vibrations.

[0030] Because of the presence of the damper mechanism 10, when the one-axis independent wheel bogie 1 is about to make a turning motion (yawing motion) relative to the vehicle body 5, a restraining force for restraining this turning motion is imparted to the one-axis independent wheel bogie 1 to make its turning motion difficult. Besides, the side rods 13a, 13b of the damper mechanism 10 are arranged at upper and lower positions so as to extend in the direction of advance of the one-axis independent wheel bogie 1. Thus, the one-axis independent wheel bogie 1 can be prevented from tumbling and turning in a pitching direction relative to the vehicle body 5.

[0031] In a left-hand portion of the one-axis independent wheel bogie 1, a centering mechanism 20 is installed. This centering mechanism 20 is composed of an L-shaped lever 21, a centering device 22, and upper and lower side rods 23a and 23b as a pair.

[0032] The lever 21 has a central portion pivotably attached to the left-hand part of the vehicle body 5. The centering device 22 is interposed between the vehicle body 5 and one side 21a of the lever 21 while connecting the vehicle body 5 and the one side 21a. The upper and lower side rods 23a and 23b are arranged so as to extend in a direction of advance of the one-axis independent wheel bogie 1, and are interposed between the bogie frame 2 and the other side 21b of the lever 21 while connecting the bogie frame 2 and the other side 21b.

[0033] Because of the presence of the centering mechanism 20, when the one-axis independent wheel bogie 1 makes a turning motion (yawing motion) relative to the vehicle body 5, a turning force can be imparted to the one-axis independent wheel bogie 1 in a direction in which the turning angle (yawing angle) of the one-axis independent wheel bogie 1 relative to the vehicle body 5 is reduced to zero. That is, the turning force can be imparted to return the one-axis independent wheel bogie 1 to a neutral position. Besides, the side rods 23a, 23b of the centering mechanism 20 are arranged at upper and lower positions so as to extend in the direction of advance of the one-axis independent wheel bogie 1. Thus, the one-axis independent wheel bogie 1 can be prevented from tumbling and turning in a pitching direction relative to the vehicle body 5.

[0034] A connecting rod 30 has a left side connected to the one side 21a of the lever 21, and has a right side connected to the one side 11a of the lever 11. This connecting rod 30, the levers 11, 21, and the side rods 13a, 13b, 23a, 23b together make up a link mechanism, which serves as a mobile center plate mechanism. Because of this mobile center plate mechanism, the one-axis independent wheel bogie 1 can make a turning motion (yawing motion) in a horizontal plane relative to the vehicle body 5.

[0035] According to the first embodiment constituted as described above, a zigzag motion (bogie yawing oscillations) does not occur in the one-axis independent wheel bogie 1 even during a high speed run. The reason is that turning of the one-axis independent wheel bogie 1 is restrained by the damper mechanism 10, and the one-axis independent wheel bogie 1 is returned to the neutral position by the centering mechanism 20.

[0036] Furthermore, motor speed control is performed by the control device 7 so that the motor speeds of the main motors 8, 8 will become equal. Thus, the wheel speeds of the right and left wheels 3, 3 equal, and when on a curved track, the one-axis independent wheel bogie 1 can make a curved run owing to a self-steering effect making use of a slope of the wheel tread of the wheels 3, 3.

[0037] Assume that the one-axis independent wheel bogie 1 runs on a small curve, for example, a very sharp small curve with R25 m which exists at only some locations of an operating route. In this case, even if motor speed control is performed to make the motor speeds of the right and left main motors 8, 8 equal, the resistance of the wheel (motor load) on an inner track becomes higher than the resistance of the outer wheel (motor load). As a result, the revolution speed of the wheel on the inner track becomes smaller than the revolving speed of the outer wheel, thus making a run on a small curve possible. Moreover, the side rods 13a, 13b, 23a, 23b of the damper mechanism 10 and the centering mechanism 20 on the right and left are arranged at upper and lower positions so as to extend in the direction of advance of the one-axis independent wheel bogie 1. Thus, tumbling and turning of the one-axis independent wheel bogie 1 in the pitching direction relative to the vehicle body 5 can be prevented on the right and left sides.

[0038] According to the present embodiment, therefore, a zigzag motion during a high speed run can be suppressed, and the bogie can be prevented from tumbling and turning in the pitching direction relative to the vehicle body, so that a safe, stable run can be ensured. A run on a curved track can also be made stably.

〈Second Embodiment〉

[0039] Next, a one-axis independent wheel bogie for a railway vehicle according to a second embodiment of the present invention will be described with reference to Fig. 4, a plan view, and Fig. 5, a side view.

[0040] The second embodiment is different from the first embodiment in the state of mounting of a damper mechanism 10 and a centering mechanism 20, but is the same in other constitutions. Thus, only parts different from the first embodiment will be described below.

[0041] As shown in the drawings, a lever 11 of the damper mechanism 10 has a central portion pivotably attached to a right-hand part of a bogie frame 2. Upper and lower side rods 13a and 13b are arranged so as to extend in a direction of advance of a one-axis independent wheel bogie 1, and are interposed between a rod

receiver 15 (vehicle body 5) fixed to the vehicle body 5 and the other side 11b of the lever 11 while connecting the rod receiver 15 and the other side 11b. The other parts of the damper mechanism 10 are the same as in the first embodiment. That is, a damper 12 is interposed between the vehicle body 5 and one side 11a of the lever 11 while connecting the vehicle body 5 and the one side 11a.

[0042] A lever 21 of a centering mechanism 20 has a central portion pivotably attached to a left-hand part of a bogie frame 2. Upper and lower side rods 23a and 23b are arranged so as to extend in a direction of advance of the one-axis independent wheel bogie 1, and are interposed between a rod receiver 25 (vehicle body 5) fixed to the vehicle body 5 and the other side 21b of the lever 21 while connecting the rod receiver 25 and the other side 21b. The other parts of the centering mechanism 20 are the same as in the first embodiment. That is, a centering device 22 is interposed between the vehicle body 5 and one side 21a of the lever 21 while connecting the vehicle body 5 and the one side 21a.

[0043] According to the second embodiment constituted as described above, turning of the one-axis independent wheel bogie 1 is restrained by the damper mechanism 10, and the one-axis independent wheel bogie 1 is returned to the neutral position by the centering mechanism 20. Thus, a zigzag motion (bogie yawing oscillations) does not occur in the one-axis independent wheel bogie 1 even during a high speed run.

[0044] Furthermore, the side rods 13a, 13b, 23a, 23b of the damper mechanism 10 and the centering mechanism 20 on the right and left are arranged at upper and lower positions so as to extend in the direction of advance of the one-axis independent wheel bogie 1. Thus, tumbling and turning of the one-axis independent wheel bogie 1 in the pitching direction relative to the vehicle body 5 can be prevented on the right and left sides.

[0045] The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

Claims

1. A one-axis independent wheel bogie for a railway vehicle, which has a pair of wheels arranged for a single bogie frame, the wheel on a right side and the wheel on a left side being rotatable individually and independently, and which also has motors for driving the right and left wheels individually, the motor speeds of the respective motors being controlled to be equal to each other, the improvement comprising:

   a centering mechanism, mounted between a vehicle body and the bogie frame, for imparting a turning force to the bogie frame in a direction in which a turning angle of the bogie frame relative to the vehicle body is reduced to zero, when the bogie frame turns relative to the vehicle body; and

   a damper mechanism, mounted between the vehicle body and the bogie frame, for imparting to the bogie frame a restraining force for restraining the bogie frame from turning relative to the vehicle body.

2. The one-axis independent wheel bogie for a railway vehicle as claimed in claim 1, wherein the centering mechanism comprises a bent lever having a central portion pivotably attached to the vehicle body, a centering device interposed between one end side of the lever and the vehicle body, and a side rod for providing a connection between the other end side of the lever and the bogie frame.

3. The one-axis independent wheel bogie for a railway vehicle as claimed in claim 1, wherein the centering mechanism comprises a bent lever having a central portion pivotably attached to the bogie frame, a centering device interposed between one end side of the lever and the vehicle body, and a side rod for providing a connection between the other end side of the lever and the vehicle body.

4. The one-axis independent wheel bogie for a railway vehicle as claimed in claim 1, wherein the damper mechanism comprises a bent lever having a central portion pivotably attached to the vehicle body, a damper interposed between one end side of the lever and the vehicle body, and a side rod for providing a connection between the other end side of the lever and the bogie frame.

5. The one-axis independent wheel bogie for a railway vehicle as claimed in claim 1, wherein the damper mechanism comprises a bent lever having a central portion pivotably attached to the bogie frame, a damper interposed between one end side of the lever and the vehicle body, and a side rod for providing a connection between the other end side of the lever and the vehicle body.

6. A one-axis independent wheel bogie for a railway vehicle, which has a pair of wheels arranged for a single bogie frame, the wheel on a right side and the wheel on a left side being rotatable individually and independently, and which also has motors for driving the right and left wheels individually, the motor speeds of the respective motors being controlled to be equal to each other, the improvement comprising:

a centering mechanism comprising a first bent lever having a central portion pivotably attached to one of right and left sides of a vehicle body, a centering device interposed between one end side of the first lever and the vehicle body, and an upper side rod and a lower side rod arranged as a pair on the one side of the vehicle body, each of the side rods extending in a direction of advance of the bogie for providing a connection between the other end side of the first lever and the bogie frame;

a damper mechanism comprising a second bent lever having a central portion pivotably attached to the other of the right and left sides of the vehicle body, a damper interposed between one end side of the second lever and the vehicle body, and an upper side rod and a lower side rod arranged as a pair on the other side of the vehicle body, each of the side rods extending in the direction of advance of the bogie for providing a connection between the other end side of the second lever and the bogie frame; and

a connecting rod for connecting the one end side of the first lever and the one end side of the second lever.

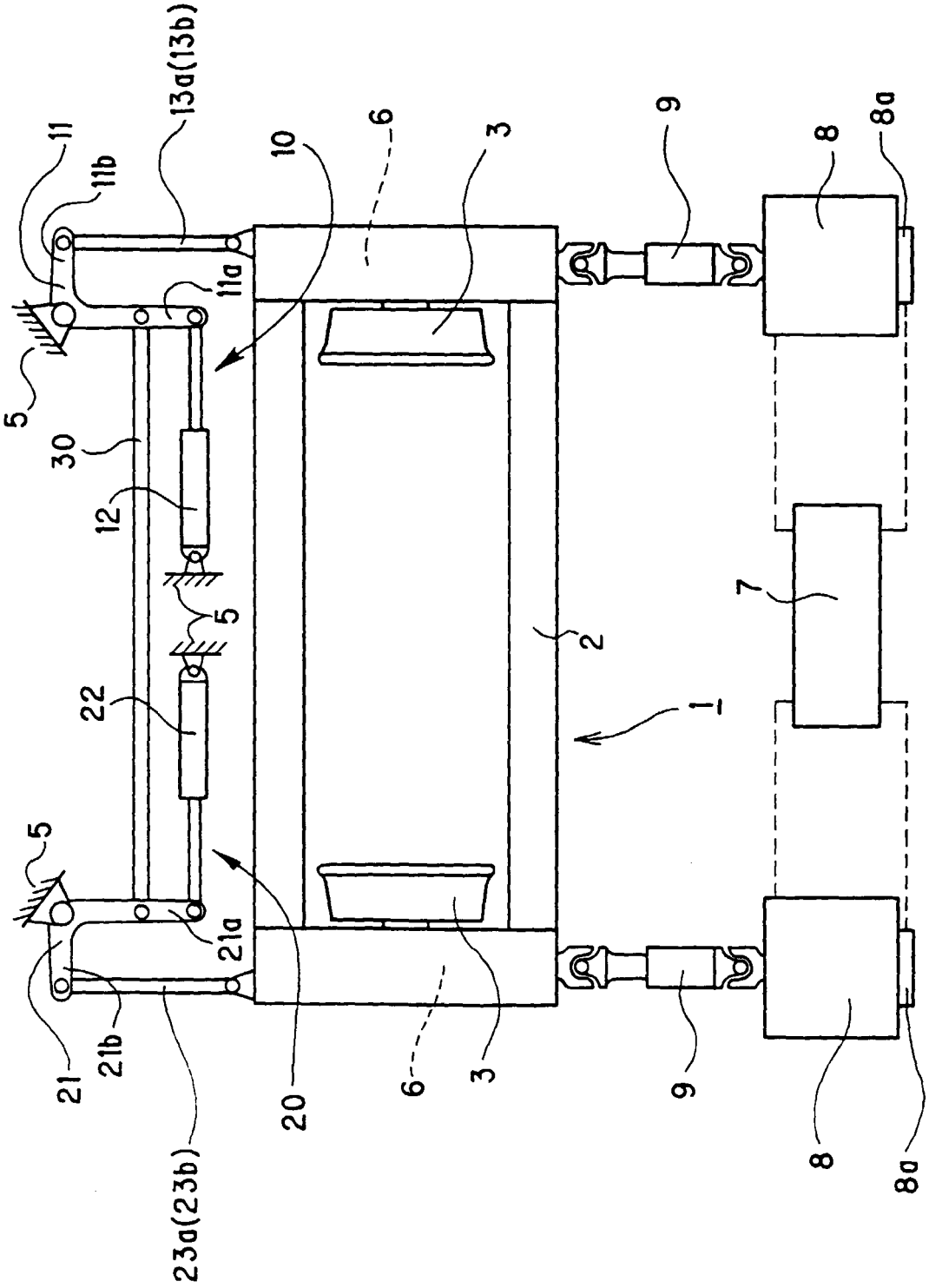
7. A one-axis independent wheel bogie for a railway vehicle, which has a pair of wheels arranged for a single bogie frame, the wheel on a right side and the wheel on a left side being rotatable individually and independently, and which also has motors for driving the right and left wheels individually, the motor speeds of the respective motors being controlled to be equal to each other, the improvement comprising:

a centering mechanism comprising a first bent lever having a central portion pivotably attached to one of right and left sides of a bogie frame, a centering device interposed between one end side of the first lever and a vehicle body, and an upper side rod and a lower side rod arranged as a pair on the one side of the bogie frame, each of the side rods extending in a direction of advance of the bogie for providing a connection between the other end side of the first lever and the vehicle body;

a damper mechanism comprising a second bent lever having a central portion pivotably attached to the other of the right and left sides of the bogie frame, a damper interposed between one end side of the second lever and the vehicle body, and an upper side rod and a lower side rod arranged as a pair on the other side of the bogie frame, each of the side rods extending in the direction of advance of the bogie for providing a connection between the other end side of the second lever and the vehicle body; and

a connecting rod for connecting the one end side of the first lever and the one end side of the second lever.

Fig.1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11b
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6
3
9
8
8a
11a
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30
12
5
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5
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2
1
21a
21
21b
23a(23b)
20
6
3
9
8
8a

Fig.2

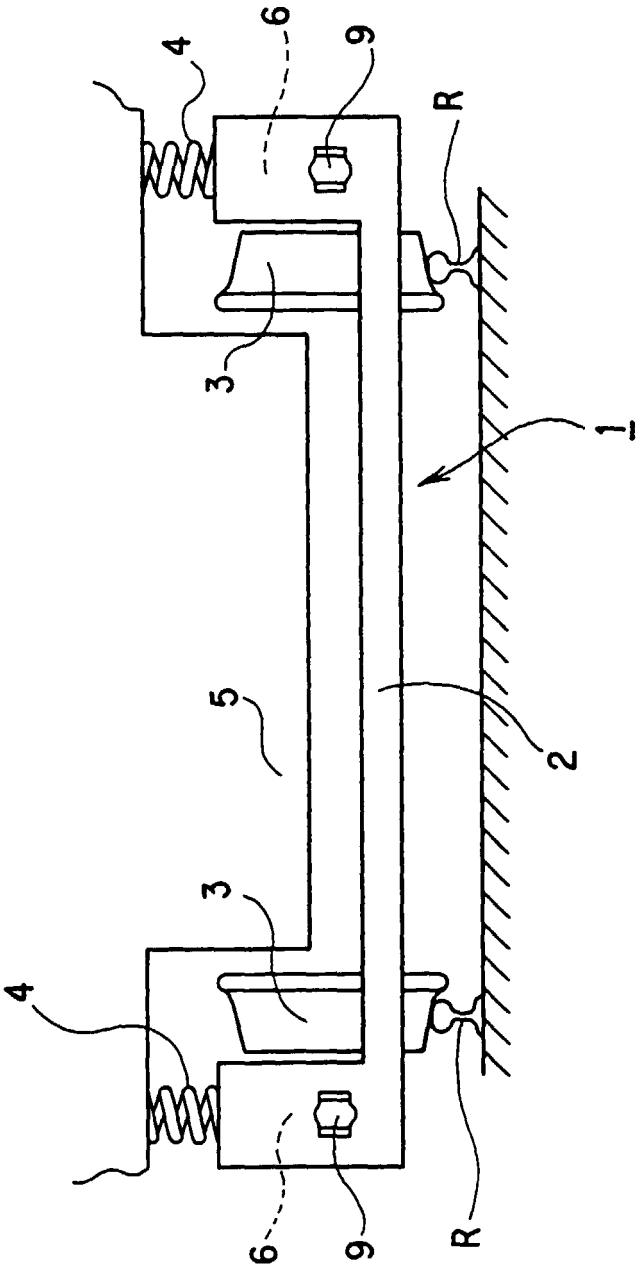


Fig.3

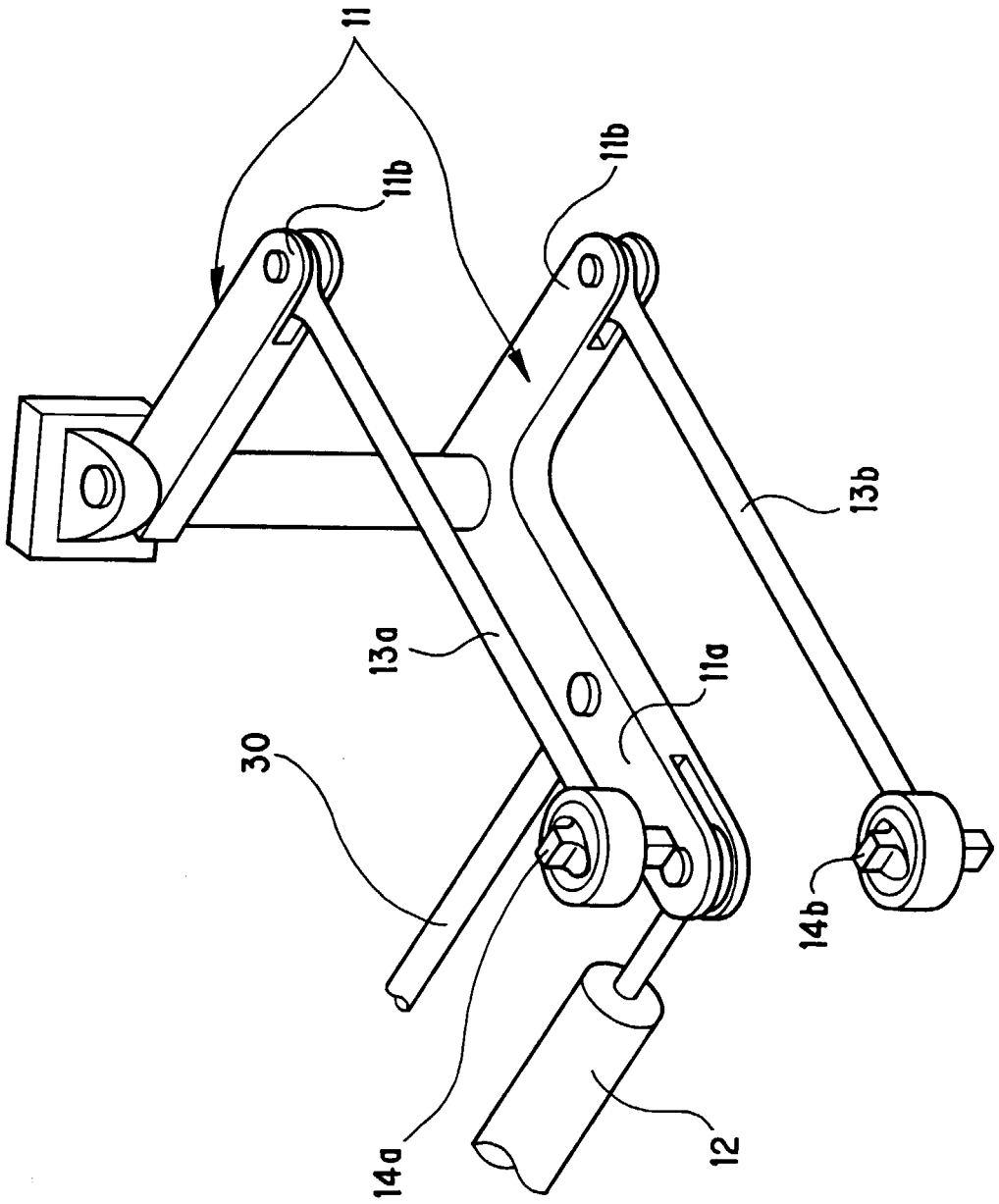
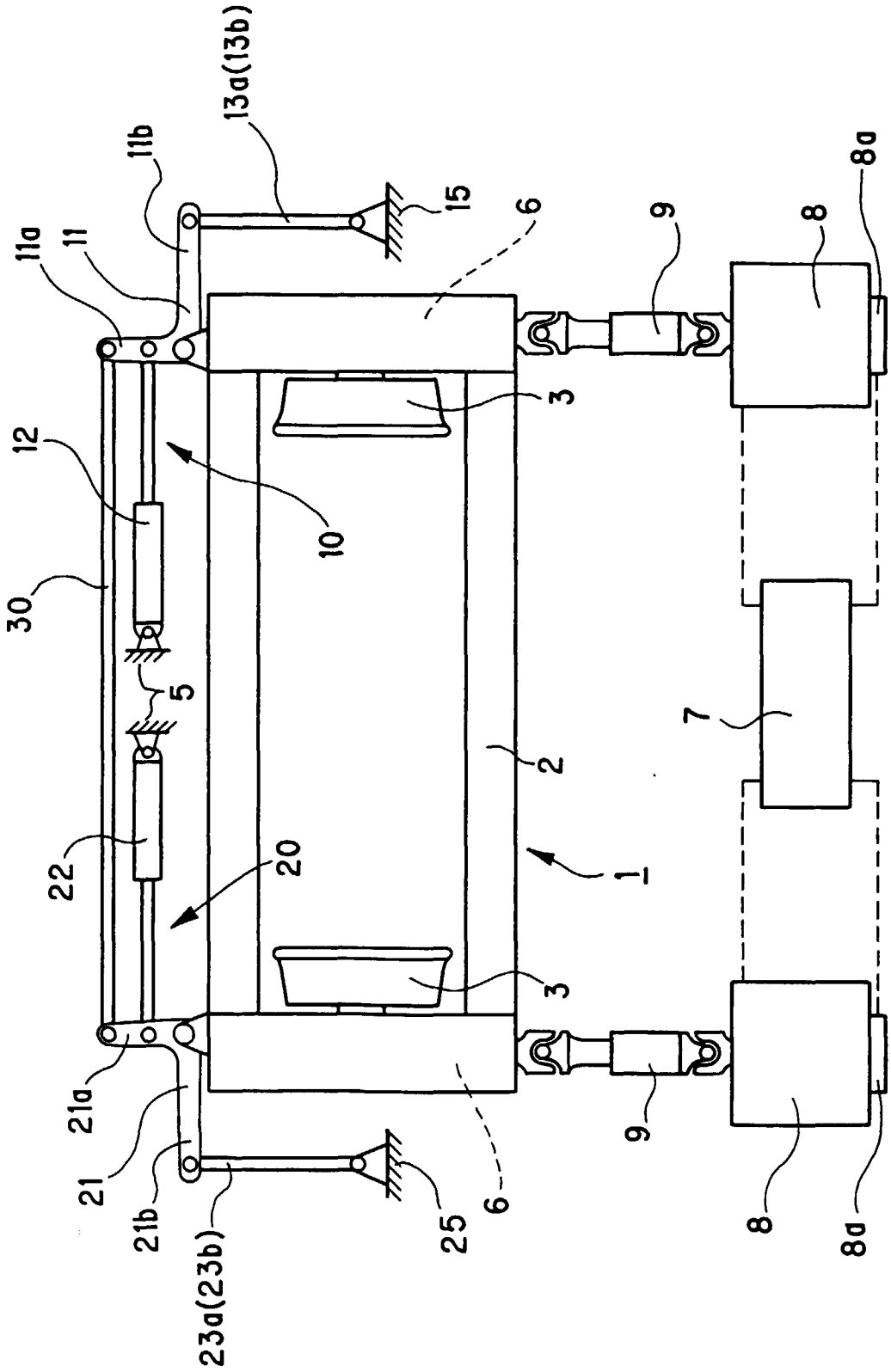


Fig.4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21b
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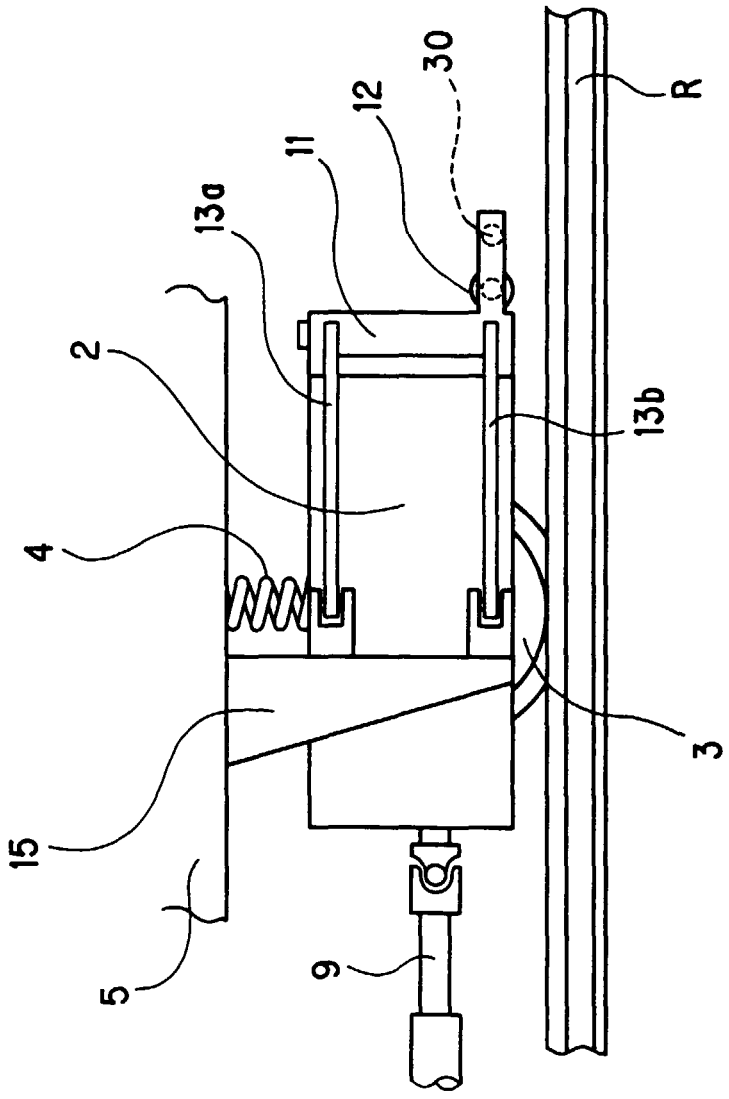
6
9
8
8a

Fig.5



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EUROPEAN SEARCH REPORT

Application Number
EP 00 10 4163

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	31 August 2000	Ferranti, M

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