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(54) WHEELSET FOR RAILWAY VEHICLES

(57) The wheelset for rail vehicles comprises two sets of wheel axles, in which each set of wheel axles comprises two wheels, each wheel being located at each side of the wheelset according to a longitudinal axis of the vehicle, wherein the two wheels of each set of wheel axles have independent axes and are linked together by a frame; so that the two frames of the set of wheel axles

are connected to one another by an articulation located in correspondence with the longitudinal axis of the vehicle and which allows to transmit tensile and compressive stress between the frames of the wheelset without modifying the distance between the axles of the pairs of wheels in each set of wheel axles.

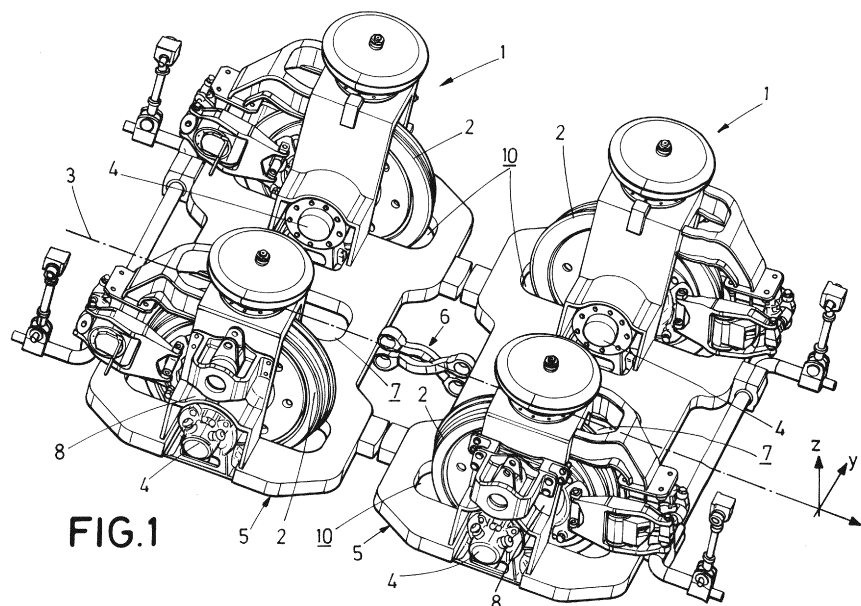


FIG.1

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention refers to a wheelset for railway vehicles, which is included in the railway transport sector.

[0002] The wheelset for railway vehicles object of the invention has as main purpose increasing the load of wagons or railway cars using a new development of an independent wheel system with a configuration of a double set of wheel axles, with a guiding system that allows the axle to correctly inscribe curves; and all this thanks to the combination of simple, reliable, low maintenance elements that ensure a quick implementation applicable to railway vehicles currently in use.

BACKGROUND OF THE INVENTION

[0003] Different types of wheelsets related to the railway sector are currently known, whose main function is the ability to transport a plurality of containers for transportation of freight or cars for passengers on rails or railways. The most common concept of wheelset consists of a set of two pairs of wheels mounted on two axles, which are close, parallel and interdependent, which are used at both ends of vehicles intended to roll on rails, known as bogies for railway vehicles.

[0004] There are multiple mechanical and pneumatic elements belonging to the wheelsets and both associated with the type of load to be transported and to the rail on which the respective railway vehicles roll; see for example the case of freight transportation, where the most important thing is the load-carrying capacity as opposed to comfort, so the wheelsets present a reinforced structure and suspensions in order to support a greater load to be transported. On the other hand, and in the transportation of people, the aim is to achieve wheelsets capable of absorbing most of the irregularities of the railway, with the aid, in some cases, of pneumatic suspension systems associated with the boxes of the rail vehicles. In both cases, the performance of the wheelset must seek to reduce wear to the wheels.

[0005] In this sense, is known the existence of applications related to constructive elements of wheelsets and that they, principally, seek to increase the weight available for the cars. See, for example:

The application of European patent No. EP-0591088-A1, which describes a bogie which presents a central frame to which are connected, by appropriate articulations, four oscillating arms, at each end of which are housed the grease boxes for each of the wheelsets. Each of these wheelsets includes a wheel associated with a separate chassis, which articulates with the central frame, thereby allowing only a relative rotation in the Y-axis between the bogie frame and the chassis that houses the

wheel. This provides both wheel axles to pivot about the bogie, in such a way that it appears an angle of attack similar to what would happen with a conventional bogie when the load capacity of the vehicle is not affected.

[0006] In the German patent application No. DE-19520549-A1, is described a wheelset having two frames with mounted wheel axles, each one of which in turn comprises two wheels linked the one to another by a common axle attached to a chassis, wherein the two frames are linked together through an articulated support, such as that for trailer truck boxes, i.e., by means of a two-pivoted lever on both chassis, and allowing free rotation at an axis perpendicular to the larger surfaces of the chassis (gravitational direction): But the independence of the movement of this wheelset is limited by the separation of the double anchoring of the two-pivoted lever. Additionally, it is noted that in each wheelset there are mounted axles instead of independent wheels.

[0007] The European patent no. EP-1789301-B1 describes a bogie formed by two wheelsets presenting respective wheels with independent axles, so that each wheel is attached to a separate sub-frame, which is subsequently attached to a main frame on which the respective sub-frames are fixed through attaching means allowing the relative movement in the gravitational sense of each wheel. Such attaching means are of mechanical type, by means of gears, and have pneumatic or hydraulic control. The above documents note the existence of advantages concerning the independence of the possible movements of the wheels depending on the type of railway; but present drawbacks referring to the large number of physical entities needed to make the axles independent from the wheels, and therefore decreasing the reliability and increasing maintenance costs.

[0008] This is why, given that existing solutions related to bogies, or more generally defined as wheelsets in order to not be limited with the restrictive definition of bogie, present a number of drawbacks linked to the reduced degree of independence of the wheel axles, as well as the amount of physical entities to be added in order to increase the independence of movement of the respective wheel, a solution is necessary capable of allowing a high degree of rolling independence for the wheels on the railway, where such solution does not incur the use of complex physical entities that require costly implementation and maintenance; where additionally the wheelset, object of the invention, is able to achieve a high load-bearing capacity for use on different types of railway vehicles regardless of the transport service to be performed.

DESCRIPTION OF THE INVENTION

[0009] The present invention relates to a wheelset for railway vehicles comprising two sets of wheel axles, in which each set of wheel axles comprises two wheels,

each wheel being located at each side of the wheelset according to a longitudinal axis of the vehicle, wherein the two wheels of each set of wheel axles have independent axes and are linked together by a frame; so that the two frames of the set of wheel axles are connected to one another by an articulation located in correspondence with the longitudinal axis of the vehicle and which allows to transmit tensile and compressive stress between the frames of the wheelset without modifying the distance between the axles of the pairs of wheels in each set of wheel axles.

[0010] By way of clarification, it is described that the main body is a wheelset, which consists of two frames interconnected through an articulated articulation that restricts the degrees of freedom between the two, where each frame includes two wheels that rotate independently between each other, as each wheel is provided with their own axle connected to the frame through the corresponding grease boxes which support the axle ends of each wheel. This is not connected to the definition of a bogie, because a bogie is a set of two pairs of wheel axles, close, parallel and interdependent through a common frame, which is used at both ends of vehicles intended to roll on rails. In the wheelset, object of the present invention, a guidance system which allows the inscription on the track of the same, is also defined.

[0011] In view of the essential technical features of the invention, it is noted that the wheelset comprises two frames that support respective pairs of wheels, where each wheel has an independent rolling axle ensuring the independent rotation there between. The frames are coupled together by an articulation situated in correspondence to the longitudinal axis. This articulation allows the separate movement of both frames, not interfering with the guidance thereof, while restricting the relative movement there between in the longitudinal axis X and rotation about the axis Y. In the subsequent paragraphs coordinate axes which will help in explaining the invention are defined.

[0012] In relation to the prior art described above, specifically with European Patent No. EP-1789301-B1; It shows that the chassis disclosed therein are different with respect to the chassis comprising the invention, as these chassis have a configuration in C, and therefore are not able to be connected to each other by an articulation located in correspondence with the longitudinal axis as defined by the wheelset object of the invention, undergoing limitations on the degrees of freedom resulting from their geometry; and hence, having a lesser degree of independence of movement. Moreover the technical solution adopted by this European patent is an active system requiring mechanical actuators controlled by control electronics for whose use multiple sensors are required that provide data to said control electronics, while the object of the invention is based on a simple and highly reliable mechanical system compared to the electronic devices of said patent.

[0013] With the idea of simulating the movement of

said wheelset through a railway track, an isometric coordinate system is described in that:

- the first coordinate axis, X, is defined along the longitudinal axis of the railway vehicle;
- the second coordinate axis Y is orthogonal to the first axis of coordinates, x; and perpendicular to the track as is defined in railway terms.
- the third coordinate axis Z is vertical, in the direction of gravitational force.

[0014] The articulation has certain restrictions in its displacement and in its movements, restrictions that are conditioned by the application itself where it is intended.

[0015] So the restrictions are basically the following:

- There is a restriction on the displacement on the X-axis or longitudinal axis of the vehicle, avoiding the approximation or separation of the distance between the sets of wheel axles.
- There is a restriction on the displacement on the Z-axis which is the vertical such that the imaginary axis that would pass through the crossing point of the two connecting rods is unchanged, although the displacement is allowed at the vertical axis Z of the connecting rods.

[0016] Moreover the displacement in axis Y is allowed which is perpendicular to the track and the movements in any of the three axes are allowed but are conditioned by the rigidity of the bushings used for the connection of the connecting rods to the sets of wheel axles.

[0017] Thus, one can describe the use and operation during the braking stage and/or acceleration of the wheelset; where the degrees of freedom are determined based on movement restrictions listed; so that free movement in the direction of the second coordinate axis Y is allowed, in addition to the third coordinate axis Z; as well as the rotations in both the first axis X and in the third coordinate axis Z, increasing the adaptability of the wheelset to the railway tracks.

[0018] Going into detail on the articulation responsible for linking the two chassis together; which is located in correspondence with the longitudinal axis of the vehicle and allows, as discussed above, the transmission of tensile and compressive stress between the chassis of the wheelset without modifying the distance between the axles of the pairs of wheels of each wheelset; the preferred option in which the articulation has an optional scissor configuration is contemplated.

[0019] This type of configuration is expanded according to the scissor definition, which is defined as a physical entity composed of two cross pieces that revolve around an axis, real or imagined. Thus is observed how the ends of the cross pieces of the articulation are coupled to each chassis of the wheelset; where preferably the axis on which both cross pieces rotate is parallel or coincident with the second coordinate axis, and, thereby, each of

the wheelsets is independent of the other and are mechanically linked due to the respective chassis and the scissor configuration.

[0020] Also, and noting said configuration, the preferred embodiment design in which the articulation comprises two curved rods which cross each other without contact and which are articulated by their ends with the chassis of the wheelset is described. Leading to an imaginary cross axis between the two curved connecting rods, and that, therefore there is no physical contact between them, which causes no friction or premature wear that requires ongoing maintenance on said articulation.

[0021] It is also noted that the ends of each of the curved connecting rods are coupled to the respective chassis by means of articulated joints; ensuring the independence of movement between both wheelsets during the movement of railway vehicles.

[0022] In order to ensure correct positioning of the rolling axle on the track, in the system the option in which the wheelset of the invention comprises a system of guide rods which directly couple the frame with each one of the adjacent boxes of the railway vehicle is contemplated; this system allows the rolling axles to inscribe tangentially on the longitudinal axis of the track both on the straight and in curves, thereby eliminating the angle of attack that occurs between the wheel and rail. The guiding system is independent for each of the frames, so that there is independence of rotation about the Z axis there between.

[0023] Said pair of guide rods having articulated ends in their respective couplings between the frame and each vehicle box, adapting to the path of the track and effectively absorbing its irregularities, besides being oriented, preferably, in parallel axis to the first coordinate axis X. And so that there are no unwanted collisions between both guide rods, they are in parallel planes to the plane formed by the first and second coordinate axes, XY plane.

[0024] Additionally the possibility that each wheel of each wheelset is coupled to its respective frame through respective grease boxes is contemplated.

[0025] Regarding the preferred design of each frame belonging to the wheelset, object of the invention, the preferred option is described where each of the frames has a flat configuration and comprises two lateral recesses corresponding to the wheels; and thereby, the axle support of each of the wheels on the frame is permitted, without need for elements for fixing the wheels that communicate the rotation thereof.

[0026] Also, in order to lighten the weight of each of the frames without lessening the strength capacity of each of them, the preferred design option in which each frame has a flat configuration and comprises a central elongated hole is contemplated; which further causes a decrease in raw material to be used in its manufacturing.

[0027] The wheelset is left supporting the two adjacent boxes of two adjacent railway vehicles, being between the two the highly effective, reliable and innovative in relation to the state of the art currently known.

[0028] Thus, the wheelset for railway vehicles thus ob-

tained can solve the drawbacks described above; since it allows a high load capacity in railway vehicles, freeing the movement of each set of wheel axles, effectively and without interfering with the guidance system in curve of each one; so that a smoother and truer guidance with respect to the path of the railway track occurs; and all thanks to the combination of simple elements, reliable, and low maintenance that ensure quick servicing that is applicable to railway vehicles currently in use.

[0029] The absence of axle between the interconnection of pairs of wheels of each set of wheel axles allows the travellers' useful floor of the railway vehicles being located at an intermediate height on the wheels rather than being above the wheels, as the corridor does not have to overcome the continuous interconnecting axle of each pair of wheels in the absence of the same.

DESCRIPTION OF DRAWINGS

[0030] To complete the description that is going to be made and to assist a better understanding of the invention's characteristics, according to a preferred practical embodiment thereof, accompanying as an integral part of said description, is a series of figures, where in an illustrative and non-limiting way, the following is represented:

Figure 1 shows a schematic three-dimensional view of the wheelset of the object of the invention.

Figure 2 shows a schematic three-dimensional view similar to that shown in Figure 1, showing the plurality of guide rods between the respective wheels of the wheelset object of the invention.

Figure 3 shows a schematic three-dimensional view of the detail of the articulation between the two frames of the wheelset object of the invention.

Figure 4 shows a two-dimensional plan view similar to that shown in Figure 2, of the wheelset object of the invention.

Figure 5 shows an elevated two-dimensional view similar to those shown in Figures 2 and 4, of the wheelset object of the invention.

PREFERRED EMBODIMENT OF THE INVENTION

[0031] In view of Figure 1 can be seen how the wheelset for rail way vehicles having two sets of wheel axles (1), wherein each set of wheel axles (1) comprises two wheels (2) being located each wheel (2) on each side of the wheelset along a longitudinal axis (3) of the vehicle, where the two wheels (2) of each set of wheel axles (1) have separate axis (4) and are linked together by a frame (5); so that the two frames (5) of the wheelset are connected together by an articulation (6) located in correspondence with the longitudinal axis (3) of the vehicle, and that allows the transmission of tensile and compressive stress between the chassis (5) of the wheelset without modifying the distance between the axis (4) of the

pairs of wheels (2) of each set of wheel axles (1).

[0032] As to their spatial arrangement with respect to the railway tracks, it is also seen in Figure 1 how an isometric coordinate system is defined such that:

- the first coordinate axis, X, is defined along the longitudinal axis (3) of the railway vehicle;
- the second coordinate axis Y is perpendicular to the track; and
- the third coordinate axis Z is vertical, in the direction of gravitational force.

[0033] The articulation has certain restrictions in its displacement in its movements, restrictions that are conditioned by the application itself where it is intended.

[0034] Therefore the restrictions are basically the following:

- There is a restriction on the displacement on the X-axis or longitudinal axis of the vehicle, avoiding the approximation or separation of the distance between the sets of wheel axles.
- There is a restriction on the displacement on the Z-axis which is the vertical such that the imaginary axis that would pass through the crossing point of the two connecting rods is unchanged, although the displacement is allowed at the vertical axis Z of the connecting rods.

[0035] Moreover the displacement in axis Y is allowed which is perpendicular to the track and the movements in any of the three axes are allowed but are conditioned by the rigidity of the bushings used for the connection of the connecting rods to the sets of wheel axles.

[0036] In relation to the articulation (6), this can be seen in all figures, especially in Figure 3, that said joint has a scissor configuration; where two connecting rods (6a, 6b) are articulated by their ends with the frames (5) of the wheelset via attachment bolts, and said curved connecting rods (6a, 6b) cross each other without being in contact at any time; so that the imaginary axis where the curved connecting rods (6a, 6b) intersect corresponds to the second coordinate axis, and. Avoiding possible wear through friction of the coupling between both chassis (5).

[0037] For clarity of detail in the accompanying figures of the present description the connection of the connecting rods (6) to the sets of wheel axles (1) have been omitted.

[0038] In view of the Figures 2 to 5 it is noted that each wheel (2) of each set of wheel axles (1) is coupled to its respective frame (5) through respective grease boxes (8). On each side of the frame (5) a pair of guide rods (9) are joined directly and respectively coupled to the adjacent railway vehicles.

[0039] Such guide rods (9) totalling eight rods due to the existence of four wheels (2) for each frame (5); said guide rods (9) belonging to different mutually parallel planes to the plane defined by the first, x, and second,

y, coordinate axes, and thereby not colliding with one another during operation.

[0040] Finally, and in view of the Figures 1 to 5, it is noted each frame (5) has a flat configuration and features:

- two grease boxes (8) in correspondence with the wheels (2) and located coincident with the axis of revolution of each wheel (2); and
- a central elongated hole (7) for lightening the mass of the frame (5) without prejudice to its resistant capacity.

[0041] Notably, the preferred use for the wheelset, object of the invention is focused on allowing the support of two boxes of two adjacent railway vehicles on the same wheelset. In addition to the configuration and connection of all physical entities allowing for a wheelset suitable for the support of heavy loads of the boxes of railway vehicles.

[0042] In view of this description and of figures, a person skilled in the art will understand that embodiments of the invention that have been described can be combined in many ways within the scope of the invention. The invention has been described according to preferred embodiments thereof, but for a person skilled in the art it will be evident that multiple variations can be introduced in said preferred embodiments without exceeding the object of the claimed invention.

Claims

1. A wheelset for railway vehicles, comprising two sets of wheel axles (1), in which each set of wheel axles (1) comprises two wheels (2), each wheel (2) being located at each side of the wheelset according to a longitudinal axis (3) of the vehicle, wherein the two wheels (2) of each set of wheel axles (1) have independent axes (4) and are linked together by a frame (5), **characterised in that** the two frames (5) are connected to one another by an articulation (6) located in correspondence with the longitudinal axis (3) of the vehicle and which allows the transmission of tensile and compressive stress between the frames (5) of the wheelset without modifying the distance between the axles (4) of the pairs of wheels (2) of each set of wheel axles (1) according to a first coordinate axis, X, defined according to the longitudinal axis of the railway vehicle.
2. The wheelset according to claim 1, **characterised in that** the articulation (6) comprises two curved connecting rods (6a, 6b) that cross each other without contact and which are articulated by their ends with the chassis (5) of the wheelset, where an isometric coordinate system is defined such that:

- the first coordinate axis, X, is defined along the longitudinal axis (3) of the railway vehicle;
 - the second coordinate axis, Y, is perpendicular to the track; and
 - the third coordinate axis, z, is vertical in the direction of gravitational force, the articulation having restrictions on its displacement and its movements, restrictions that are conditioned by the application itself where it is intended, and involve
- a restriction on the displacement on the X-axis or longitudinal axis of the vehicle, avoiding the approximation or separation of the distance between the sets of wheel axles;
 - a restriction on the displacement on the Z-axis which is vertical, so that the imaginary axis that would pass through the crossing point of the two connecting rods is unchanged, although the displacement is allowed in this vertical axis, Z, of the connecting rods.
3. The wheelset according to any of the preceding claims, **characterised in that** the articulation (6) has a scissor configuration.
 4. The wheelset according to any of the preceding claims, **characterised in that** each set of wheel axles (1) comprises a guide rod (9) directly coupled to said railway vehicle.
 5. The wheelset according to claim 4, **characterised in that** each wheel (2) of each set of wheel axles (1) is coupled to its respective frame (5) through respective grease boxes (8).
 6. The wheelset according to any of the preceding claims, **characterised in that** each frame (5) has a flat configuration and comprises two grease box supports corresponding to each wheel (2).
 7. The wheelset according to any of the preceding claims, **characterised in that** the frame (5) has an elongated central hole (7).
 8. The wheelset, defined according to any of claims 1 to 7, to support two boxes of two adjacent railway vehicles in one single wheelset.

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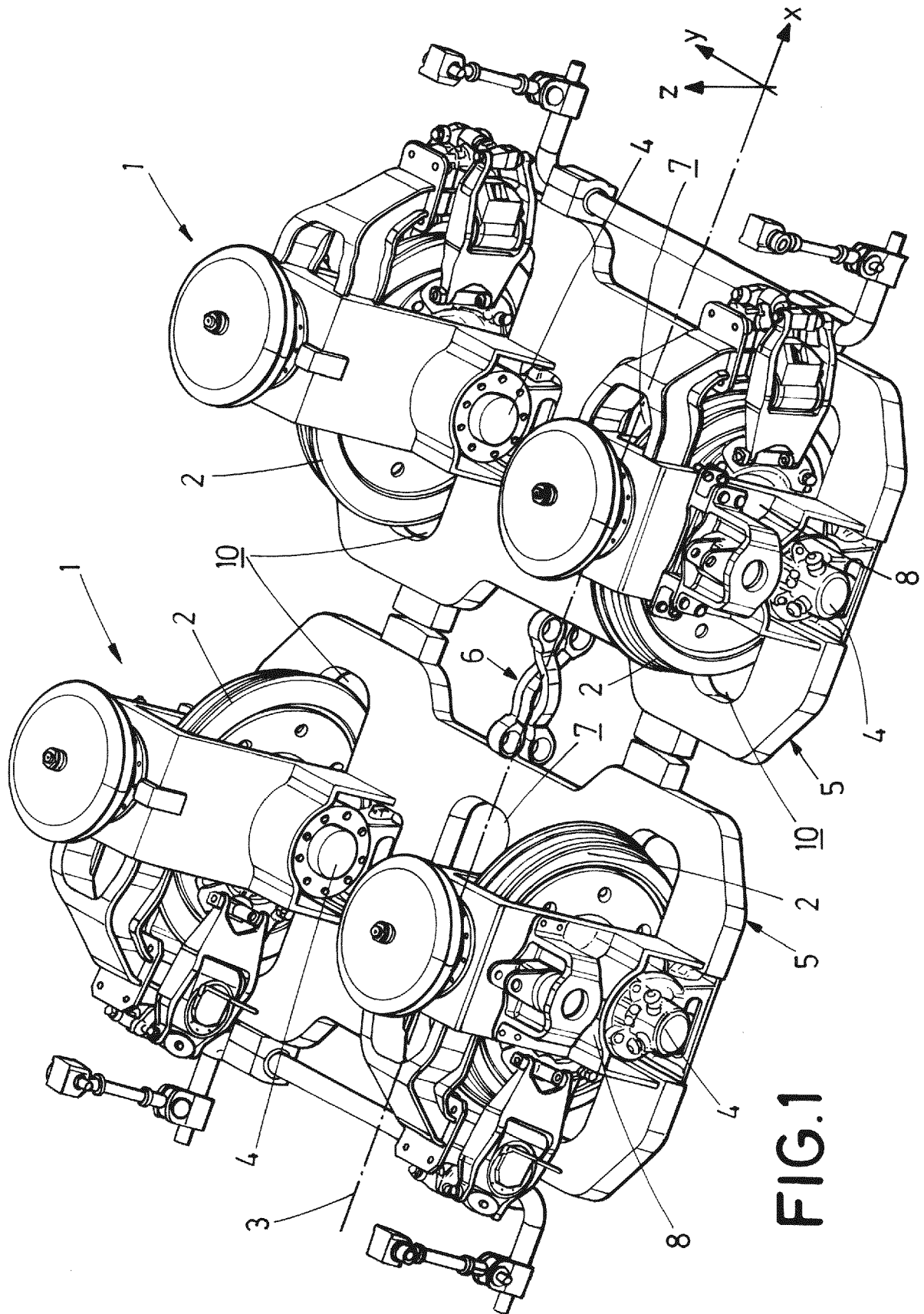


FIG.1

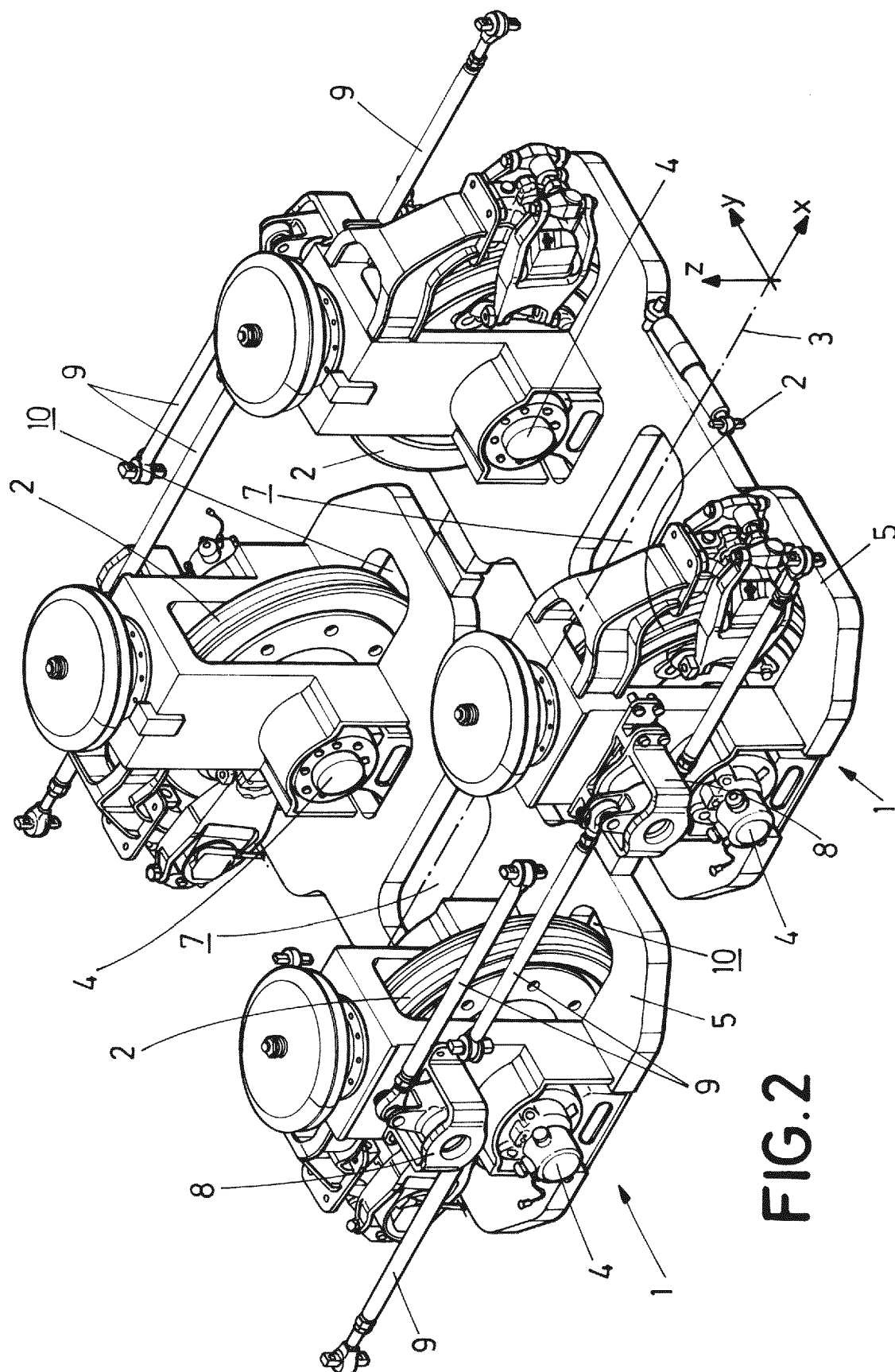


FIG.2

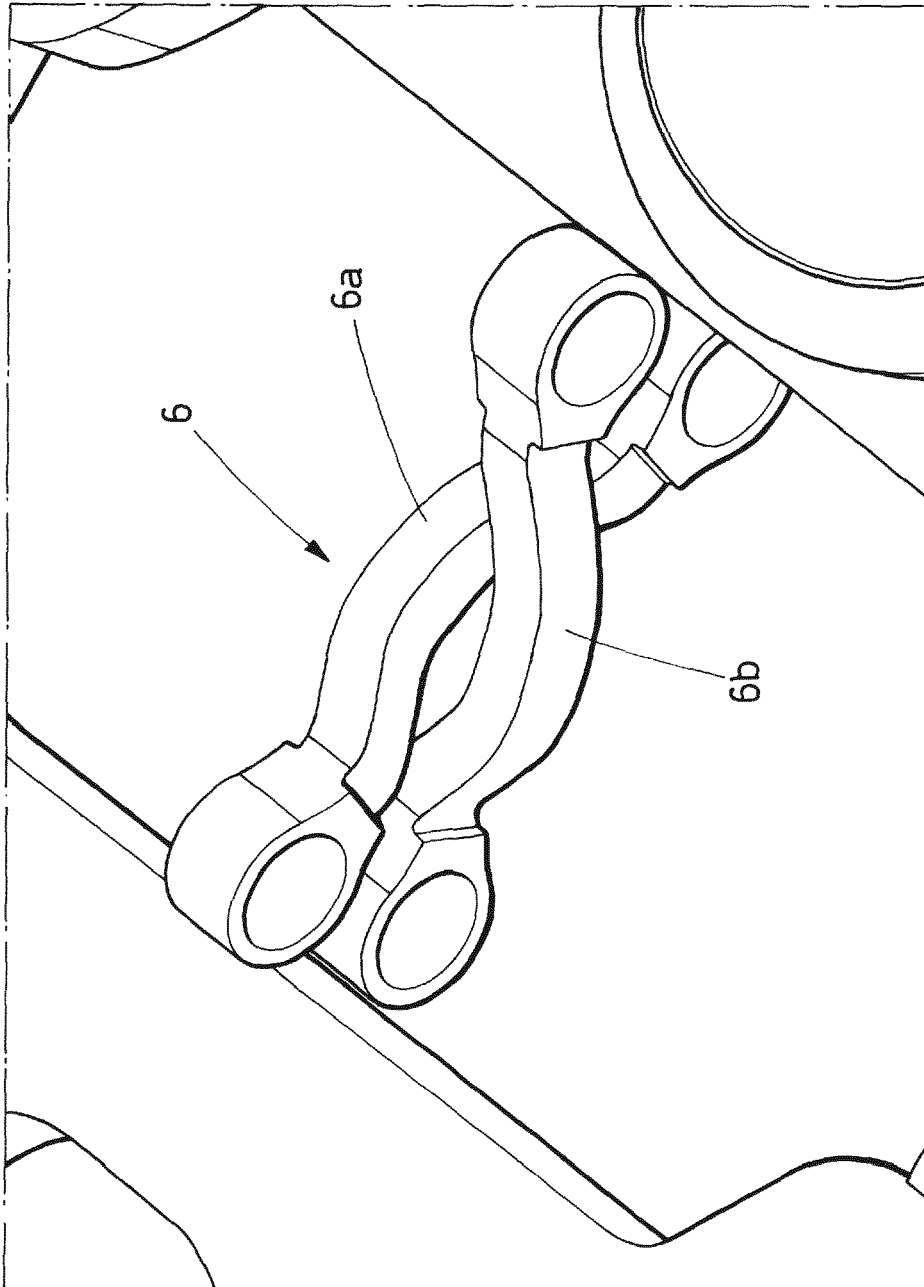
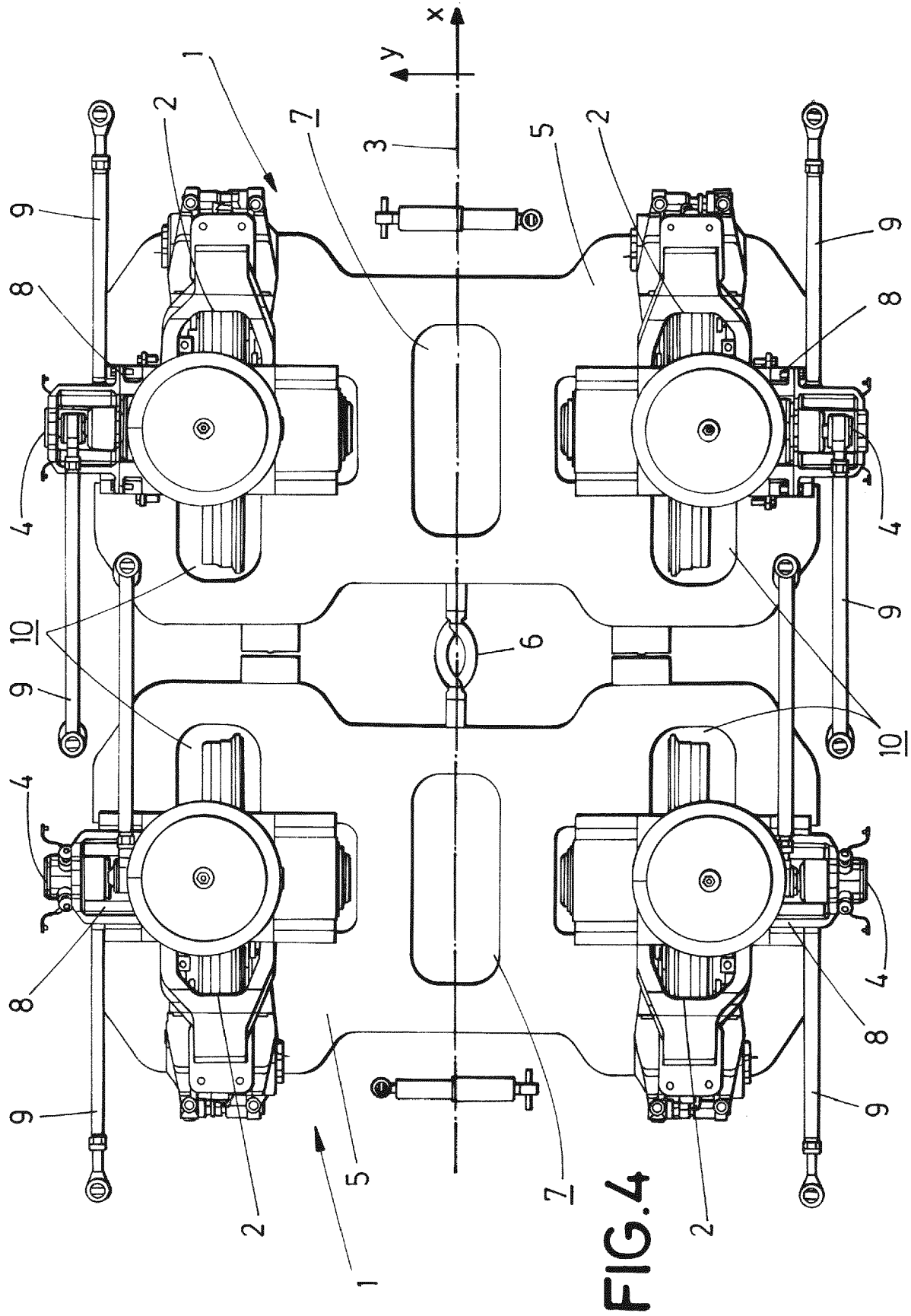
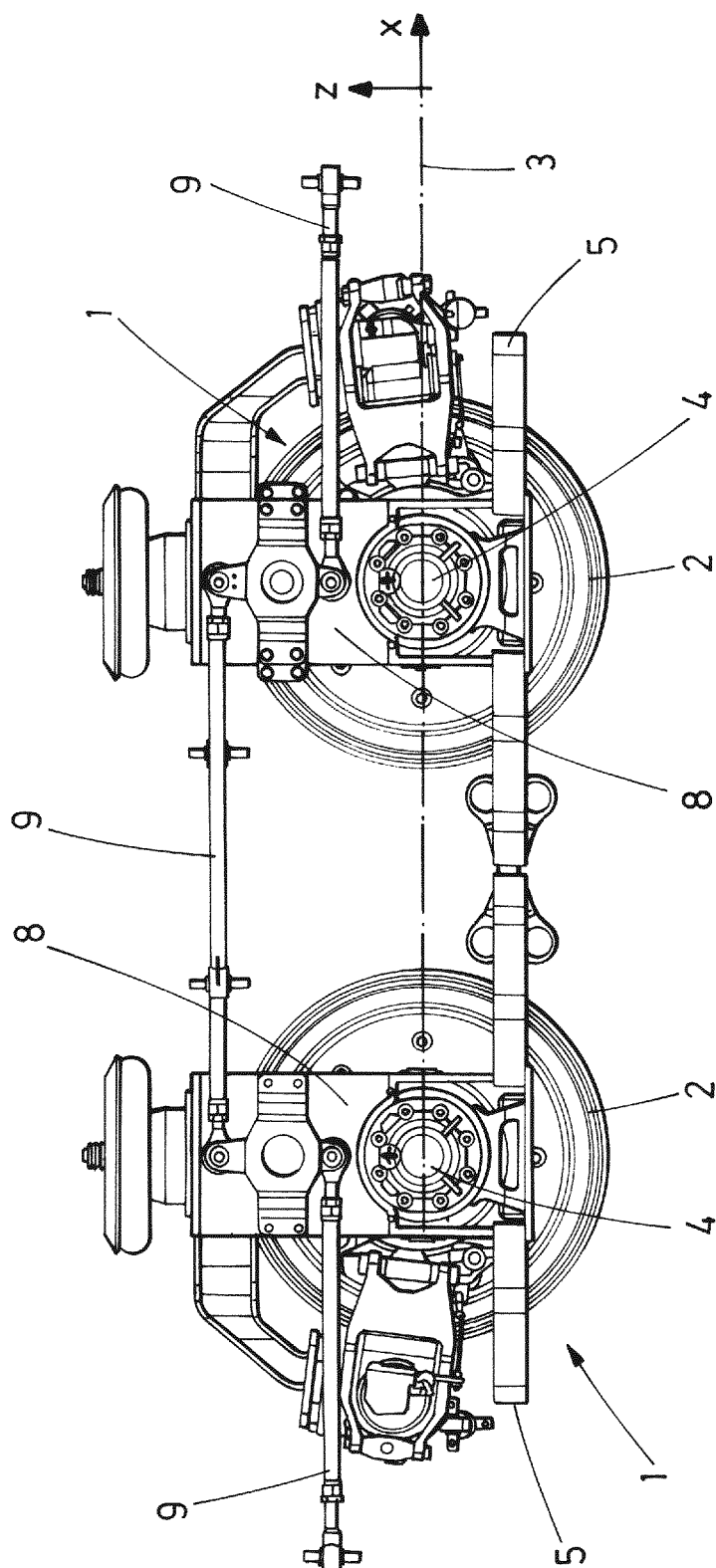


FIG.3





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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	FR 2 874 883 A1 (GUILLEMAUT HENRI [FR]) 10 March 2006 (2006-03-10) * page 3, line 22 - page 7, line 30; figures 1-9 *	1-8	INV. B61F3/16
A	DE 31 20 105 A1 (AUTOMATISK DOSERINGS KOMPENSAT [SE]) 6 May 1982 (1982-05-06) * page 8, line 18 - page 13, line 13; figures 1-13 *	1-8	
A	US 2 823 623 A (HEREDIA FRANCISCO M F) 18 February 1958 (1958-02-18) * column 2, line 6 - column 4, line 65; figures 1-9 *	1-8	
A	US 2 908 229 A (FURRER JOHN R) 13 October 1959 (1959-10-13) * column 2, line 56 - column 8, line 11; figures 1-17 *	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			B61F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 April 2016	Examiner Lendfers, Paul
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ON EUROPEAN PATENT APPLICATION NO.**

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2874883 A1	10-03-2006	AT 465061 T EP 1789301 A1 ES 2342545 T3 FR 2874883 A1 WO 2006027485 A1	15-05-2010 30-05-2007 08-07-2010 10-03-2006 16-03-2006
DE 3120105 A1	06-05-1982	DE 3120105 A1 SE 452141 B	06-05-1982 16-11-1987
US 2823623 A	18-02-1958	CH 323815 A ES 213135 A1 FR 1104364 A US 2823623 A	15-08-1957 01-05-1954 18-11-1955 18-02-1958
US 2908229 A	13-10-1959	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0591088 A1 [0005]
- DE 19520549 A1 [0006]
- EP 1789301 B1 [0007] [0012]