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United States Patent Application Publication

20250256542

Kind Code

A1

Publication Date

August 14, 2025

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WORK VEHICLE COMPRISING A SENSOR FOR DETECTING MOVEMENT OF A HEIGHT-SETTABLE AXLE

Abstract

A work vehicle comprising a vehicle support structure, a vehicle axle, a longitudinal rocking arm attached to the vehicle axle and comprising a first connection locus connected to the vehicle support structure, a sensor configured for detecting movement of the vehicle axle and a vehicle suspension system comprising a vehicle suspension link device comprising a link element comprising a second connection locus connected to the vehicle axle and a third connection locus connected to the vehicle support structure. The work vehicle comprises a sensor link comprising a first attachment point connected to the vehicle axle and a second attachment point connected to the sensor, the first attachment point being located on a virtual straight axis connecting the first connection locus of the longitudinal rocking arm and the second connection locus of the link element.

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Family ID: 1000008480740

Appl. No.: 19/051208

Filed: February 12, 2025

Foreign Application Priority Data

EP 24305242

Feb. 13, 2024

Publication Classification

Int. Cl.: B60G9/00 (20060101); B60G7/00 (20060101); B60G17/00 (20060101)

U.S. Cl.:

Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to European patent application No. EP24305242, filed on Feb. 13, 2024, disclosed herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates generally to the field of work vehicles and particularly to a work vehicle comprising a height-settable vehicle axle and a sensor for measuring a distance between the vehicle axle and a vehicle support structure.

BACKGROUND

[0003] A work vehicle as a tractor typically comprises a vehicle axle connected to a vehicle support structure via a vehicle suspension system comprising a vehicle suspension link device. The vehicle axle comprises two front wheels or two rear wheels that are in contact with the ground.

[0004] The vehicle suspension link device comprises a link element with a first and a second ball joints for connection of the link element to the vehicle support structure and to the vehicle axle respectively.

[0005] The vehicle support structure is in particular a chassis or a body of the work vehicle, or else an undercarriage or a frame of the vehicle. In a vehicle suspension system, the link element, also referred to as “panhard link”, acts to prevent or restrain movement of the axle in directions other than in a vertical or substantially vertical plane. In particular, the link element, which usually extends transversely to the vehicle front-back direction, prevents or contributes to prevent that the wheels attached to the axle move laterally, that is side-to-side.

[0006] In the present disclosure, the terms “frontward,” “rearward,” “transverse”, “side,” “upper,” and “lower” may be understood relative to a direction in which the vehicle, on which the suspension link device is mounted, is travelling.

[0007] The position (the height) of the vehicle support structure relative to the axle may be vary and may be adjusted, automatically or manually.

[0008] To allow for such adjustment, the distance between the vehicle support structure and the front axle must be measured by a sensor.

[0009] The sensor measures movements of the axle in a vertical direction. The link element may be associated with the sensor for detecting and measuring the movement of the axle.

[0010] In some circumstances, in particular in case the vehicle is a work vehicle, such as a tractor or the like, intended to travel on uneven ground and potentially subject to heavy stresses, there is a risk for the link element to be subject to undesired movements which might adversely affect accuracy of the measurement made by the sensor.

[0011] Also, the suspension link system may be deliberately mounted so as to allow a small extent of “unwanted movements”. For example, in a work vehicle, the vehicle axle may be connected to a first end of a longitudinal rocking arm. The longitudinal rocking arm extends rearward the axle and a second end of the longitudinal rocking arm is connected to the vehicle support structure via a ball joint comprising a pivot point. A rotation of the longitudinal rocking arm causes the axle to rotate around the pivot point, thus causing a 3D movement of the link element.

[0012] However, an undesired movement of the link element in a non-vertical direction due to the axle tilting can erroneously be taken into account by the sensor in the measurement of the axle

movement that the sensor aims at measuring.

[0013] EP4140786B1 aims at solving this issue in providing a work vehicle comprising a suspension link device having a curved link element with a first and a second connection locus for connection of the link element to the vehicle support structure and to a vehicle axle respectively. The work vehicle comprises a sensor link attached to the link element at an attachment point located on a virtual straight axis joining the first connection locus and the second connection locus of the link element. The sensor link is connected to an angle sensor.

[0014] However, the curved link element has itself a tilting freedom due to the two ball joints at the first and a second connection locus that can affect the accuracy of the sensor measurements.

[0015] Straight link elements are more commonly used but their tilting movements also affect the accuracy of the measurement.

[0016] Moreover, the shape of the curved link element is not optimized compared to traction/compression efforts contrary. Straight link elements are preferred.

SUMMARY

[0017] The present disclosure aims at avoiding or at least substantially limiting the risks that an undesired movement of the link element be erroneously taken into account by the sensor in the detection of the axle movement enabling to determinate with accuracy the position of the vehicle axle relative to the vehicle support structure.

[0018] Accordingly, the present application provides a work vehicle comprising a vehicle support structure, a vehicle axle and a longitudinal rocking arm attached to the vehicle axle. The longitudinal rocking arm comprises a first connection locus connected to the vehicle support structure. The work vehicle comprises a sensor configured for detecting movement of the vehicle axle relative to the vehicle support structure and a vehicle suspension system comprising a vehicle suspension link device. The vehicle suspension link device comprises a link element comprising a second connection locus connected to the vehicle axle and a third connection locus connected to the vehicle support structure.

[0019] The work vehicle comprises a sensor link comprising a first attachment point connected to the vehicle axle and a second attachment point connected to the sensor. The first attachment point is located on a virtual straight axis connecting the first connection locus of the longitudinal rocking arm and the second connection locus of the link element.

[0020] Thus, the application provides a work vehicle comprising a sensor device enabling to detect the movement of the vehicle axle relative to the vehicle support structure with accuracy. The sensor can measure the distance between the vehicle axle and the vehicle support structure with accuracy. The measurement accuracy is not affected by the vehicle axle tilting movements neither by the link element tilting movements.

[0021] The application also enables to use conventional straight link elements having an optimized shape for traction/compression efforts. Cost reductions are also achieved.

[0022] Optionally, the first attachment point is located between the first connection locus and the second connection locus.

[0023] Optionally, the first connection locus of the longitudinal rocking arm is connected to the vehicle support structure via a first ball joint comprising a first spherical bearing, the first spherical bearing comprising a first center defining the first connection locus.

[0024] Optionally, the second connection locus of the link element is connected to the vehicle axle via a second ball joint comprising a second spherical bearing, the second spherical bearings comprising a second center defining the second connection locus.

[0025] Optionally, the sensor link is connected to the vehicle axle via a fourth ball joint comprising a fourth spherical bearing, the first attachment point of the sensor link being at a fourth center of the fourth spherical bearing.

[0026] Optionally, the virtual straight axis belongs to a central plan of the work vehicle crossing axially the middle of the vehicle axle and the middle of the longitudinal rocking arm.

[0027] Optionally, the sensor is attached to the vehicle support structure, the sensor link being a transmitting sensor link caused to move due to a movement of the vehicle axle and configured to transmit said movement to the sensor.

[0028] Optionally, it comprises a bracket secured to the vehicle axle, the first attachment point being connected to the bracket.

[0029] Optionally, the bracket is secured to a rear part of the vehicle axle connected to the longitudinal rocking arm.

[0030] Optionally, the vehicle axle comprises a main part perpendicular to the longitudinal rocking arm, the bracket being located near the main part, at a distance d inferior than 5 cm from the main part for instance.

[0031] Optionally, the first attachment point is located between the first connection locus and the main part of the vehicle axle.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] Other features, aims and advantages of the application will be detailed in the following description, which is purely illustrative and should not be interpreted in a limiting way, and which should be read in view of the enclosed drawings, wherein:

[0033] FIG. 1 is a schematic representation of a front part of a work vehicle according to an aspect of the present disclosure.

[0034] FIG. 2 is a detailed representation of a first connection locus of a longitudinal rocking arm of the work vehicle of the FIG. 1.

[0035] FIG. 3 illustrates a second connection locus of a link element and a first attachment point of a sensor link.

[0036] FIG. 4 is a detailed representation of the second connection locus of the link element.

[0037] FIG. 5 is a detailed representation of the first attachment point of the sensor link.

[0038] In the various drawings, elements in common are designated by identical numeral references.

DETAILED DESCRIPTION

[0039] FIG. 1 is a schematic representation of front part of a work vehicle according to an aspect of the present disclosure.

[0040] Although the work vehicle is described with reference to a specific example, it should be understood that modifications and changes may be made to this example without going beyond the general scope as defined by the claims. Consequently, the description and the drawings should be considered in a sense that is illustrative rather than restrictive. The figures, which are not necessarily to scale, depict illustrative aspects and are not intended to limit the scope of the disclosure. The illustrative aspects depicted are intended only as exemplary.

[0041] While aspects of the disclosure are amenable to various modifications and alternative forms, specifics thereof have been shown by way of example in the drawings and will be described in detail. It should be understood, however, that the intention is not to limit aspects of the disclosure to the particular embodiment(s) described. On the contrary, the intention of this disclosure is to cover all modifications, equivalents, and alternatives falling within the scope of the claims.

[0042] Additionally, the language used herein has been principally selected for readability and instructional purposes, and may not have been selected to delineate or circumscribe inventive subject-matter. Accordingly, the disclosure of the present disclosure is intended to be illustrative, but not limiting, of the scope of the disclosure, which is set forth in the claims.

[0043] As used in this disclosure and the appended claims, the singular forms “a,” “an,” and “the” include plural referents unless the content clearly dictates otherwise. As used in this disclosure and

the appended claims, the term “or” is generally employed in its sense including “and/or” unless the content clearly dictates otherwise.

[0044] Throughout the description, including the claims, the terms “comprising a,” “including a,” and “having a” should be understood as being synonymous with “comprising one or more,” “including one or more,” and “having one or more” unless otherwise stated. In addition, any range set forth in the description, including the claims should be understood as including its end value(s) unless otherwise stated. Specific values for described elements should be understood to be within accepted manufacturing or industry tolerances known to one of skill in the art, and any use of the terms “substantially,” “approximately,” and “generally” should be understood to mean falling within such accepted tolerances.

[0045] FIG. 1 shows a work vehicle as a tractor comprising a vehicle support structure **1**, a vehicle axle **2** and a longitudinal rocking arm **3** attached to the vehicle axle **2**.

[0046] The vehicle axle **2** extends in a transverse direction Y and comprises a main part **22** and a rear part **21** extending from a central part **27** of the main part **22** according to an axial direction X, perpendicular to the transverse direction Y. The longitudinal rocking arm **3** has a first end **31** that is fixed to the rear part **21** of the vehicle axle **2**. The longitudinal rocking arm **3** extends from the rear part **21** in the axial direction X.

[0047] The longitudinal rocking arm **3** comprises a second end **32**, opposed to the first end **31** and provided with a first connection locus **4** connected to the vehicle support structure **1** via a first ball joint comprising a first spherical bearing. The first spherical bearing comprises a first center **12** defining the first connection locus **4** as shown in the FIG. 2.

[0048] Optionally, the first connection locus **4** can be defined by another part of the first ball joint that differs from the first center **12**.

[0049] Here, “connection locus”, which may also be referred to as “connection site”, refers to the location, in the longitudinal rocking arm **3** enabling the second end **32** to be connected to the vehicle support structure **1**.

[0050] The first connection locus **4** comprises a first hole **11** housing the first spherical bearing. The first center **12** of the first spherical bearing is also the center of the first hole **11**. The first hole **11** has a circular section.

[0051] The first spherical bearing can comprises a first spherical ball portion (not shown) provided with first projecting rod portions projecting from the first spherical ball portion.

[0052] The lateral ends of the vehicle axle **2** are provided with mounts **23a** and **23b** for mounting wheels. In particular, the vehicle axle **2** may be a vehicle axle for steerable wheels located at a front side of the work vehicle or at a rear side of the work vehicle.

[0053] The work vehicle comprises a vehicle suspension system comprising suspension dampers **24a**, **24b** such as hydraulic cylinders, connected to the vehicle axle **2**, at first respective ends **25a** and **25b** of the suspension dampers **24a**, **24b** via two respective ball joints, while second respective ends **26a** and **26b** of the suspension dampers **24a**, **24b** are intended to be connected to a vehicle support structure **1** (shown in phantom line), such as a chassis or a body of the work vehicle **2**, or an undercarriage or a frame of the work vehicle **2**, via two other respective ball joints.

[0054] The vehicle suspension system comprises a suspension link device **6** at a front face **28** of the central part **27** of the vehicle axle **2**, which comprises a link element **7**, generally oriented in the vehicle transverse direction Y. A first end **29a** of the link element **7** is connected to the vehicle axle **2** via a supporting bracket **30**. A second end **29b** of the link element **7** is configured to be connected to the vehicle support structure **1**. The link element **7** is also referred to as “panhard rod”.

[0055] As shown in particular in FIGS. 1 and 3, the first end **29a** has a second connection locus **8a** for connection to the vehicle axle **2**.

[0056] Similarly, the second end **29b** has a third connection locus **8b** for connection to the vehicle support structure **1**.

[0057] Here, “connection locus”, which may also be referred to as “connection site”, refers to the

location, in the link element **7** enabling the link element **7** to be connected to the vehicle support structure **1** and the vehicle axle **2**, respectively.

[0058] In the example, the link element **7** is configured to be connected to the vehicle axle **2** via a second ball joint **13a** comprising a second spherical bearing **14a**, as shown in FIG. **4**. The second spherical bearing **14a** comprises a second center **15a** defining the second connection locus **8a**.

[0059] Optionally, the second connection locus **8a** can be defined by another part of the second ball joint **13a** that differs from the second center **15a**.

[0060] The second connection locus **8a** or site comprises a second hole **33a** at the first end **29a** of the link element **7**, said second hole **33a** housing the second spherical bearing **14a**. The second spherical bearing **14a** comprises a second spherical ball portion **34a** provided with second projecting rod portions **35a** and **35b**, projecting from the second spherical ball portion **34a** frontward and rearward, respectively.

[0061] In particular, the second projecting rod portions **35a** and **35b** may be end portions of a rod arranged in a through hole of the second spherical ball portion **34a**. The second projecting rod portions **35a** and **35b** are for connection with the supporting bracket **30** fixed to the central part **27** of the vehicle axle **2**. The second spherical bearing **14a** is located between two protrusions **37**, **38** of the supporting bracket **30**.

[0062] More precisely, these second projecting rod portions **35a** and **35b** are configured to be fixed to the supporting bracket **30** in releasable manner, for example in being engaged in holes at the upper portions of the protrusions **37**, **38** of the supporting bracket **30** and secured therein by securing pins or the like.

[0063] On the example, as best seen in FIG. **3**, the first end **29a** of the link element **7** is sandwiched between the two protrusions **37**, **38** of the supporting bracket **30** secured to the vehicle axle **2** at its lower portion. The second projecting rod portions **35a** and **35b** are engaged in holes at the upper portions of the protrusions **37**, **38**.

[0064] The second center **15a** of the second spherical bearing **14a** is also the center of the second ball joint **13a** and the center of the second spherical ball portion **34a** and the center of the second hole **33a**.

[0065] The third connection locus **8b** or site is similar to the second connection locus **8a**.

[0066] The third connection locus **8b** comprises a third hole **33b** at the second end **29b** of the link element **7**, said second hole **33b** housing the third spherical bearing **14b**. The third spherical bearing **14b** comprises a third spherical ball portion **34b** provided with third projecting rod portions **39a** and **39b**, projecting from the third spherical ball portion **34b** frontward and rearward, respectively. In particular, the third projecting rod portions **39a** and **39b** may be end portions of a rod arranged in a through hole of the third spherical ball portion **34b**. The third projecting rod portions **39a** and **39b** are for connection with the vehicle support structure **1**.

[0067] Similarly than for the second connection locus **8a**, the third projecting rod portions **39a** and **39b** may be engaged in protrusions of a supporting bracket (not shown) secured to the vehicle support structure **1**.

[0068] The third spherical bearing **14b** has a third center **15b** which is also the center of the third ball joint **13b**.

[0069] The work vehicle of the embodiment comprises a sensor device **40** for detecting the displacement of the vehicle axle **2** relative to the vehicle support structure. The height or the distance of the vehicle support structure **1** relative to the vehicle axle **2** can be determined by a control device.

[0070] The sensor device **40** comprises a sensor link **9** for detecting the movement of the vehicle axle **2**. The sensor link **9** is attached to the vehicle axle **2** at a first attachment point **10a**.

[0071] The first attachment point **10a** is located on a virtual straight axis **A** joining the first connection locus **4** of the longitudinal rocking arm **3** and the second connection locus **8a** of the link element **7**.

[0072] In the example, the virtual axis A passes through the respective geometric centers **12** and **15a** of the first and second connection loci **4** and **8a**.

[0073] The first center **12** of the first spherical bearing defines the first connection locus **4**. The second center **15a** of the second spherical bearings **14a** defines the second connection locus **8a**.

[0074] Said differently, the virtual axis A passes through the respective geometric centers **12** and **15a** of the first spherical bearing and second spherical bearings **14a**.

[0075] The virtual axis A passes also through the respective geometric centers **12** and **15a** of the first hole **11** of the first connection locus **4** and the second hole **33a** of the second connection locus **8a**.

[0076] The first attachment point **10a** is located between the first connection locus **4** and the second connection locus **8a**.

[0077] In the example, the virtual straight axis A and the first attachment point **10a** belong to a central plan of the work vehicle crossing the middle of the vehicle axle **2** and the middle of the longitudinal rocking arm **3**. The central plan is parallel to the axial direction X.

[0078] As best seen in FIGS. **3** and **5**, a bracket **20** is secured to the vehicle axle **2**. The first attachment point **10a** is connected to the bracket **20**.

[0079] The bracket **20** is secured to the rear part **21** of the vehicle axle **2** that is connected to the longitudinal rocking arm **3**. As said previously, the rear part **21** extends from the central part **27** of the main part **22**.

[0080] In the example, the bracket **20** is located in a central position of the rear part **21** of the vehicle axle **2** according to the transverse direction Y.

[0081] The bracket **20** is preferably positioned in the vicinity of the central part **27** of the main part **22** of the vehicle axle **2**. For instance, the bracket **20** is located at a distance d inferior than 5 cm from the central part **27** of the main part **22** of the vehicle axle **2** and preferably inferior to 2 cm. The bracket **20** is preferably positioned as close as possible to the central part **27** of the main part **22** of the vehicle axle **2** in order to improve the measurement accuracy of the sensor **5**.

[0082] Alternatively, the bracket **20** can be directly attached to the central part **27** of the main part **22** of the vehicle axle **2**.

[0083] Alternatively, the bracket **20** is attached to the central part **27** next to the second connection locus **8a**. The bracket **20** is attached to the central part **27** at a distance less than 5 cm from the second connection locus **8a** and preferably less than 3 cm, for instance.

[0084] The sensor link **9** is secured to a first end **41** of the bracket **20**. The bracket **20** extends from an upper face **43** of the rear part **21** of the vehicle axle **2** and perpendicularly with respect to the upper face **43**. The bracket **20** extends sensibly perpendicularly to the axial direction X and perpendicularly to the transverse direction Y.

[0085] The bracket **20** has a second end **42** that may be secured to the vehicle axle **2** by any suitable means, such as, for example, bolts or riveting or welding.

[0086] The sensor link **9** may be secured to the bracket **20** by any suitable means, in particular means allowing a releasable fixation, such as bolts or the like.

[0087] In the example, the sensor link **9** is connected to the bracket **20** via a fourth ball joint **16a** comprising a fourth spherical bearing. The first attachment point **10a** of the sensor link **9** is at a fourth center **18a** of the fourth spherical bearing.

[0088] Optionally, the first attachment point **10a** is defined by another part of the fourth spherical bearing that differs from the fourth center **18a**.

[0089] The sensor link **9** comprises a first end **44** having a fourth hole **17a** housing the fourth spherical bearing. The fourth center **18a** of the fourth spherical bearing is also the center of the fourth hole **17a**.

[0090] The fourth spherical bearing comprises a fourth spherical ball portion provided with a fourth projecting rod portion **45**, projecting from the fourth spherical ball portion. The fourth projecting rod portion **45** is engaged in a hole provided at the first end **41** of the bracket **20**.

[0091] The first end **44** of the sensor link **9** has a 3 degrees of freedom relative to the bracket **20**.

[0092] The sensor **5** is attached to the vehicle support structure **1**. The sensor link **9** is a transmitting sensor link caused to move due to a movement of the vehicle axle **2** and configured to transmit said movement to the sensor **5**.

[0093] In the example, the sensor link **9** is a sensor rod having a second end **46** connected to the sensor **5** by a link rod **19** in articulated manners.

[0094] The sensor link **9** formed by the sensor rod generally extends in a generally vertical plane and a vertical movement of the vehicle axle **2** with respect to the vehicle support structure **1** causes the link rod **19** to rotate. In the example, the sensor **5** is an angular sensor that measures the angle covered by such rotation and, hence, the magnitude of the vertical movement of the vehicle axle **2**.

[0095] The sensor link **9** can be connected to the link rod **19** via a ball joint, for instance.

[0096] The distance between the vehicle axle **2** and the vehicle support structure **1** is settable, automatically or manually. The control device enables to set automatically the distance between the vehicle axle **2** and the vehicle support structure **1**. The control device receives the measurements of the sensor **5** and manages the suspension dampers **24a**, **24b** stroke via an automatic regulation loop, for instance.

[0097] A manual mode is also possible. The driver can pilot the suspension dampers **24a**, **24b** stroke depending of the current position of the vehicle axle **2** relative to the vehicle support structure **1** showed on a vehicle dashboard.

[0098] The sensor **5** measures an angle variation of the link rod **19** that is converted in a distance variation between the vehicle axle **2** and the vehicle support structure **1** by the control device.

[0099] The sensor link **9** and the link rod **19** remain at the same position whatever the tilting of the vehicle axle **2** with respect to the vehicle support structure **1**.

[0100] The tilting movement of the vehicle axle **2** and the tilting movement of the link element **7** do not affect the angle measurement and thus the measurement of the position of the vehicle axle **2** relative to the vehicle support structure **1**.

[0101] The first attachment point **10a** of the fourth center **18a** of the fourth spherical bearing of the sensor element **9** is located on the virtual axis A. The first center **12** of the first spherical bearing of the longitudinal rocking arm **3**, the second center **15a** of the second spherical bearings **14a** of the link element **7** are located on the virtual straight axis A.

[0102] Although the present disclosure herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present disclosure.

[0103] It is intended that the specification and examples be considered as exemplary only, with a true scope of the disclosure being indicated by the following claims.

[0104] Additionally, all of the disclosed features of the system may be transposed, alone or in combination, to a method and/or an apparatus and vice versa.

Claims

1. A work vehicle comprising a vehicle support structure, a vehicle axle, a longitudinal rocking arm attached to the vehicle axle and comprising a first connection locus connected to the vehicle support structure, a sensor configured for detecting movement of the vehicle axle relative to the vehicle support structure and a vehicle suspension system comprising a vehicle suspension link device comprising a link element comprising a second connection locus connected to the vehicle axle and a third connection locus connected to the vehicle support structure, the work vehicle comprising a sensor link comprising a first attachment point connected to the vehicle axle and a second attachment point connected to the sensor, the first attachment point being located on a virtual straight axis connecting the first connection locus of the longitudinal rocking arm and the second connection locus of the link element.

2. The work vehicle according to claim 1, wherein the first attachment point is located between the first connection locus and the second connection locus.
3. The work vehicle according to claim 1, wherein the first connection locus of the longitudinal rocking arm is connected to the vehicle support structure via a first ball joint comprising a first spherical bearing, the first spherical bearing comprising a first center defining the first connection locus.
4. The work vehicle according to claim 1, wherein the second connection locus of the link element is connected to the vehicle axle via a second ball joint comprising a second spherical bearing, the second spherical bearings comprising a second center defining the second connection locus.
5. The work vehicle according to claim 1, wherein the sensor link is connected to the vehicle axle via a fourth ball joint comprising a fourth spherical bearing, the first attachment point of the sensor link being at a fourth center of the fourth spherical bearing.
6. The work vehicle according to claim 1, wherein the virtual straight axis belongs to a central plan of the work vehicle crossing axially the middle of the vehicle axle and the middle of the longitudinal rocking arm.
7. The work vehicle according to claim 1, wherein the sensor is attached to the vehicle support structure, the sensor link being a transmitting sensor link caused to move due to a movement of the vehicle axle and configured to transmit said movement to the sensor.
8. The work vehicle according to claim 1, further comprising a bracket secured to the vehicle axle, the first attachment point being connected to the bracket.
9. The work vehicle according to claim 8, wherein the bracket is secured to a rear part of the vehicle axle connected to the longitudinal rocking arm.
10. The work vehicle according to claim 9, wherein the vehicle axle comprises a main part perpendicular to the longitudinal rocking arm, the bracket being located at a distance d inferior than 5 cm from the main part.
11. A work vehicle comprising a vehicle support structure, a vehicle axle, a longitudinal rocking arm attached to the vehicle axle and comprising a first connection locus connected to the vehicle support structure, a sensor configured to detect movement of the vehicle axle relative to the vehicle support structure and a vehicle suspension system comprising a vehicle suspension link device comprising a link element comprising a second connection locus connected to the vehicle axle and a third connection locus connected to the vehicle support structure, the work vehicle comprising a sensor link comprising a first attachment point connected to the vehicle axle and a second attachment point connected to the sensor.
12. The work vehicle of claim 11, wherein the first attachment point is located on a virtual straight axis connecting the first connection locus of the longitudinal rocking arm and the second connection locus of the link element.
13. The work vehicle according to claim 12, wherein the first attachment point is located between the first connection locus and the second connection locus.
14. The work vehicle according to claim 12, wherein the first connection locus of the longitudinal rocking arm is connected to the vehicle support structure via a first ball joint comprising a first spherical bearing, the first spherical bearing comprising a first center defining the first connection locus.
15. The work vehicle according to claim 12, wherein the second connection locus of the link element is connected to the vehicle axle via a second ball joint comprising a second spherical bearing, the second spherical bearings comprising a second center defining the second connection locus.
16. The work vehicle according to claim 12, wherein the sensor link is connected to the vehicle axle via a fourth ball joint comprising a fourth spherical bearing, the first attachment point of the sensor link being at a fourth center of the fourth spherical bearing.
17. The work vehicle according to claim 12, wherein the virtual straight axis belongs to a central

plan of the work vehicle crossing axially the middle of the vehicle axle and the middle of the longitudinal rocking arm.

18. The work vehicle according to claim 12, wherein the sensor is attached to the vehicle support structure, the sensor link being a transmitting sensor link caused to move due to a movement of the vehicle axle and configured to transmit said movement to the sensor.

19. The work vehicle according to claim 12, further comprising a bracket secured to the vehicle axle, the first attachment point being connected to the bracket.

20. The work vehicle according to claim 19, wherein the bracket is secured to a rear part of the vehicle axle connected to the longitudinal rocking arm; wherein the vehicle axle comprises a main part perpendicular to the longitudinal rocking arm, the bracket being located at a distance d inferior to 5 cm from the main part.
