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(54) **APPARATUS FOR TOE AND/OR CAMBER ADJUSTMENT FOR A RUNNING GEAR OF A MOTOR VEHICLE**

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See application file for complete search history.

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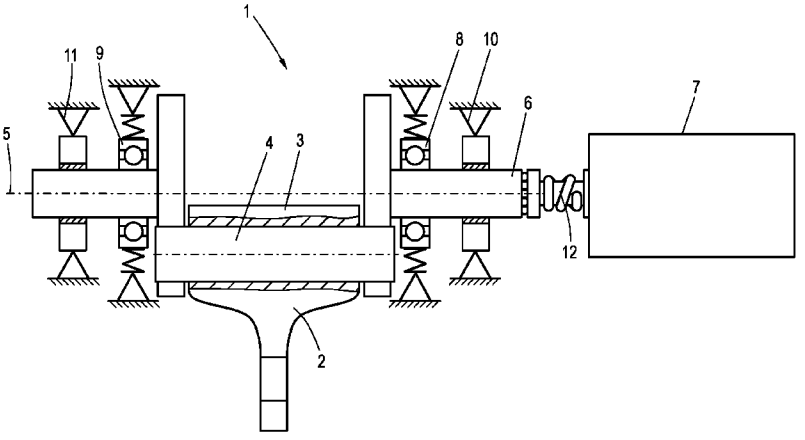
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(57) **ABSTRACT**

An apparatus for toe and/or camber adjustment for a running gear of a motor vehicle, having a tie rod and/or a link which can be fastened at one side to a bearing fixed with respect to the car body and at the other side by a bearing can be fastened to the wheel carrier of a wheel of the motor vehicle, wherein one bearing has an adjustment element which is in the form of an eccentric and which has an eccentric shaft, which eccentric shaft can be adjusted by an adjustment drive and is assigned safety bearings arranged on both sides of the eccentric.

20 Claims, 2 Drawing Sheets



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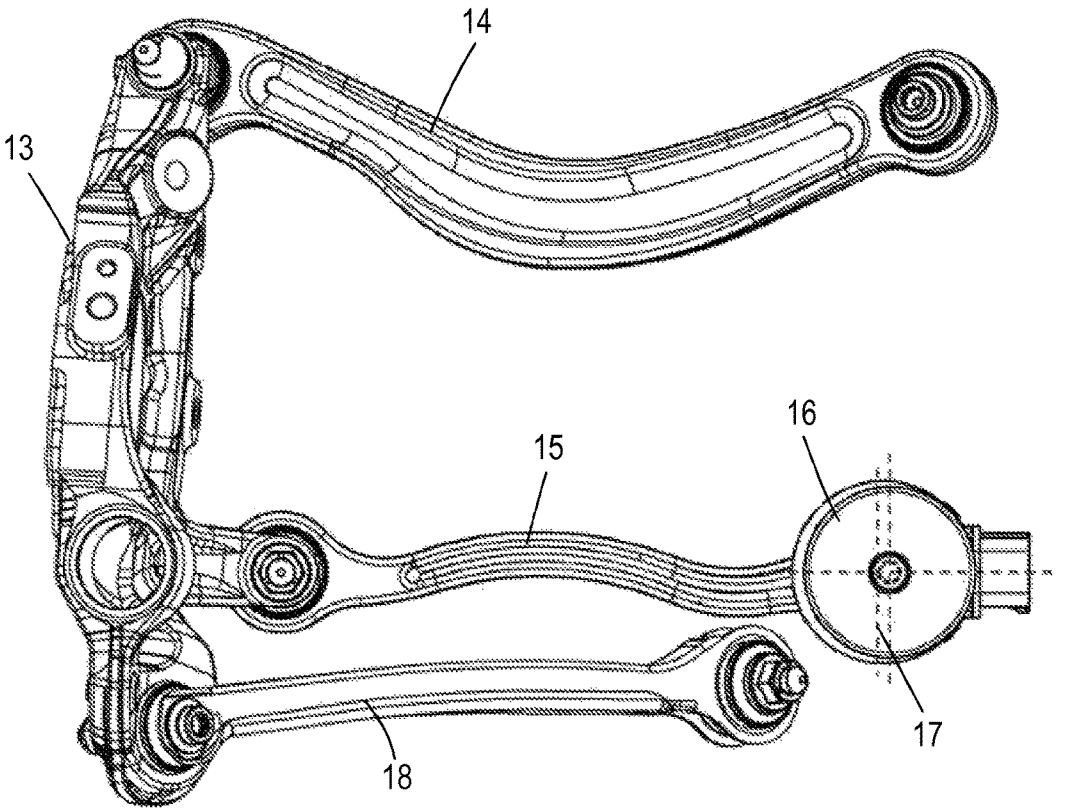
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FIG. 1



Prior Art

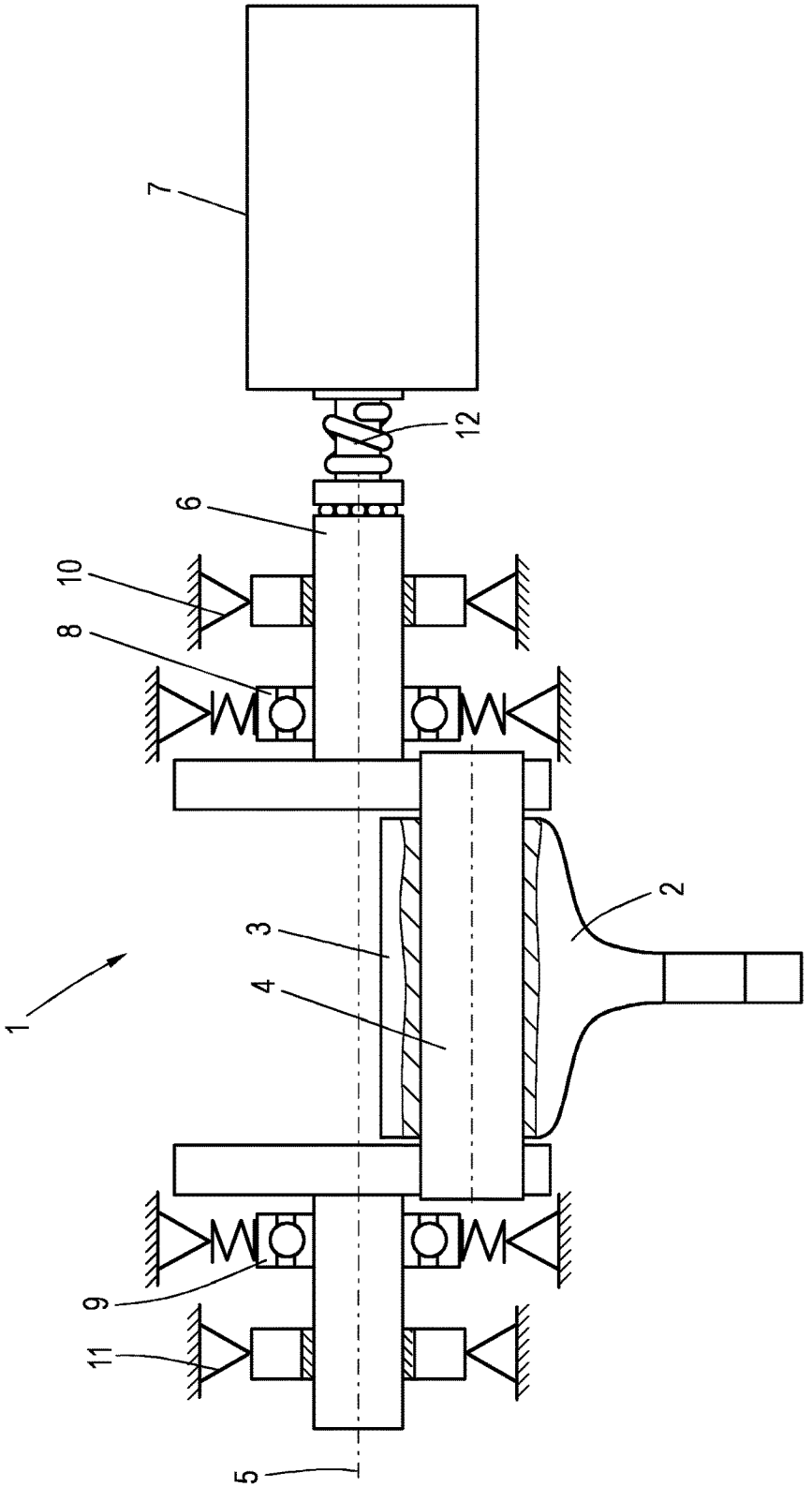


FIG. 2

APPARATUS FOR TOE AND/OR CAMBER ADJUSTMENT FOR A RUNNING GEAR OF A MOTOR VEHICLE

FIELD OF THE INVENTION

The invention relates to an apparatus for toe and/or camber adjustment for a running gear of a motor vehicle, having a tie rod and/or a link that can be fastened or is fastened at one side to a bearing fixed with respect to the car body and at the other side by a bearing to the wheel carrier of a wheel of the motor vehicle, wherein a bearing has an adjustment element that is in the form of an eccentric and has an eccentric shaft that can be adjusted by an adjustment drive.

BACKGROUND

Apparatuses for running gears or wheel suspensions of motor vehicles are already known with which a toe and/or camber adjustment can be performed. Typically, a wheel of a vehicle is connected by a link (wheel link) and a tie rod to the vehicle body (chassis). The link or the tie rod is here usually attached on the wheel side by a bearing. The other end of the link or the tie rod can be connected by a bearing on the side of the car body to the chassis, to a component connected to the chassis, or to a steering gear. By adjusting the bearing position in the transverse direction of the vehicle, the toe or camber can be adjusted.

FIG. **1** shows a cutout of a conventional running gear, comprising a wheel carrier **13** to which a crossmember **14** is attached in an articulated way. The wheel carrier **13** is connected to a tie rod **15** that has an adjustment element constructed as an eccentric **16**. The dashed lines **17** show the two positions between which the tie rod can be adjusted in order to influence a parameter of the running gear. The running gear shown in section in FIG. **1** comprises, in addition, a wheel link **18** is attached to the wheel carrier **13** in an articulated way.

In DE 10 2010 055 060 A1, an adjustment apparatus for toe or camber adjustment is disclosed. The apparatus comprises a bearing that contacts a bolt on the outside. The bolt is coupled, in turn, with eccentric plates that are supported on guide elements attached stationary on the chassis. By rotating the bolt connected to the eccentric plates, the bearing can be displaced perpendicular to the bearing axis.

In DE 10 2005 052 833 A1, an apparatus for adjusting a link of a wheel suspension is disclosed. The apparatus comprises an active eccentric bearing that can be rotated and thus adjusted by an electric adjustment motor. The eccentric shaft is supported in sliding bearings.

So that the high forced transmitted by the link to the eccentric shaft can also be received in extreme situations, the radial bearings must be dimensioned with comparatively large dimensions for supporting the eccentric shaft.

SUMMARY

The invention is based on the object of providing an apparatus for toe and/or camber adjustment, which is formed for receiving high forces and nevertheless has a small packaging space.

To achieve this objective in an apparatus of the type specified above, it is provided according to the invention that safety bearings arranged on both sides of the eccentric are allocated to the eccentric shaft.

The elastic safety bearings provided according to the invention come into operation only under high radial forces that are transmitted from the tie rod or the link to the eccentric shaft and the bearing fixed to the car body. The safety bearings are provided on both sides of the tie rod or the link on the eccentric shaft, so that the eccentric shaft is supported in the safety bearings. Because an overload of the bearing fixed to the car body is prevented, this bearing can have small dimensions accordingly, nevertheless all running gear forces are reliably received.

In the apparatus according to the invention, it is preferred that the safety bearings are constructed as sliding bearings that are suitable for receiving the high running gear forces that occur.

In the apparatus according to the invention it is preferred that the safety bearings are designed so that under normal loading they are not engaged although they are in contact. Accordingly, during normal operation the eccentric shaft is supported only by the bearing fixed to the car body, but not by the safety bearing.

With respect to the bearing fixed to the car body in the apparatus according to the invention, it is preferred that the eccentric shaft is supported in radial spring-mounted roller bearings.

In order to prevent damage to the eccentric shaft and the adjustment drive, it can be provided that, in the apparatus according to the invention, an overload coupling is arranged between the adjustment drive and the eccentric shaft. When a specified torque is reached on the eccentric shaft, the overload coupling is opened, whereby the connection to the adjustment drive and the eccentric shaft is decoupled. The decoupling is also used to protect the motor. In this way, damage, for example, in the form of deformation of the running gear link, is prevented. Preferably, the overload coupling automatically closes again as soon as the overload state no longer exists. The wheel position can be sensed by a sensor and then the toe and camber can be readjusted by the apparatus according to the invention.

The overload coupling of the apparatus according to the invention can have a spring element, preferably a spiral compression spring, wherein the spring element is supported on one side on the eccentric shaft and on the other side on the adjustment drive.

The adjustment drive of the apparatus according to the invention can be formed advantageously as an electric motor. Advantageously, the electric motor is connected to a transmission. Because the adjustment drive can be arranged directly on the eccentric shaft, the necessary packaging space is comparatively low.

In a vehicle, advantageously multiple such apparatuses according to the invention are provided, wherein an apparatus can be allocated to each tie rod or to each link. Through multiple such apparatuses that each have an adjustment drive as an actuator, an especially wheel-individual adjustment can be realized in comparison to the use of only one single adjuster.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention is shown in the drawing and is described in more detail below. Shown are:

FIG. **1** components of a conventional running gear with an adjustment apparatus, and

FIG. **2** an apparatus according to the invention for toe and/or camber adjustment for a motor vehicle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The apparatus **1** shown in FIG. **2** comprises a running gear link that is designated below as link **2**. One end **3** of the link **2** is supported so that it can rotate on an eccentric shaft **4**. The opposite end not shown in the drawing is attached on the wheel side by a bearing.

Reference symbol **5** indicates the rotational axis of the eccentric shaft **4**. A shaft section **6** is coupled with an adjustment drive **7** constructed as an electric motor and having a transmission. The two-part shaft section **6** is supported in radial spring-mounted bearings **8**, **9**. In the shown embodiment, the bearings **8**, **9** are roller bearings. In addition to each bearing **8**, **9**, there is a safety bearing **10**, **11** that is designed so that the shaft sections **6** do not load the safety bearing **10**, **11** during normal operation. Only when there is a large force that is transmitted via the link **2** or in other constructions via a tie rod to the eccentric shaft **4** do the safety bearings **10**, **11** come into operation so that the shaft sections **6** are supported by the safety bearings **10**, **11**. The spring-mounted support of the bearings **8**, **9** prevents the bearings **8**, **9** from being damaged in the event of an elevated radial force.

Between the adjustment drive **7** and the shaft section **6** there is an overload coupling **12** that automatically decouples the adjustment drive **7** and the shaft section **6** when a specified limit for the torque is exceeded. As soon as the high torque is no longer active, the overload coupling **12** automatically closes again. The wheel position is then detected by a sensor and then the link **2** is set back into the desired position.

LIST OF REFERENCE NUMBERS

1 Apparatus
2 Link
3 End
4 Eccentric shaft
5 Rotational axis
6 Shaft section
7 Adjustment drive
8 Bearing
9 Bearing
10 Safety bearing
11 Safety bearing
12 Overload coupling
13 Wheel carrier
14 Crossmember
15 Tie rod
16 Eccentric
17 Lines
18 Wheel link

The invention claimed is:

1. An apparatus for at least one of toe or camber adjustment for a running gear of a motor vehicle, comprising at least one of a tie rod or a link that is fastenable at one side to a bearing fixed with respect to a car body and at another side by a bearing to a wheel carrier of a wheel of the motor vehicle, one of said bearings has an adjustment element including an eccentric and an eccentric shaft that is adjustable by an adjustment drive, and safety bearings arranged on both axial sides of the eccentric and axially away from the eccentric are allocated to the eccentric shaft, further comprising a pair of spring-mounted bearings each located axially between a respective one of the safety bearings and the eccentric.

2. The apparatus according to claim **1**, wherein the safety bearings are formed as sliding bearings or rubber bearings.

3. An apparatus for at least one of toe or camber adjustment for a running gear of a motor vehicle, comprising at least one of a tie rod or a link that is fastenable at one side to a bearing fixed with respect to a car body and at another side by a bearing to a wheel carrier of a wheel of the motor vehicle, one of said bearings has an adjustment element including an eccentric and an eccentric shaft that is adjustable by an adjustment drive, and safety bearings arranged on both sides of the eccentric are allocated to the eccentric shaft, wherein the safety bearings are configured so that the safety bearings are not loaded during normal operation.

4. The apparatus according to claim **1**, further comprising an overload coupling arranged between the adjustment drive and the eccentric shaft.

5. The apparatus according to claim **4**, wherein the overload coupling has a spring element that is supported on one side on the eccentric shaft and on another side on the adjustment drive.

6. The apparatus according to claim **1**, wherein the adjustment drive is comprises an electric motor.

7. The apparatus according to claim **6**, wherein the electric motor is coupled with a transmission.

8. The apparatus according to claim **3**, wherein the safety bearings are formed as sliding bearings or rubber bearings.

9. The apparatus according to claim **3**, wherein the eccentric shaft is supported in radially spring-mounted roller bearings.

10. The apparatus according to claim **3**, further comprising an overload coupling arranged between the adjustment drive and the eccentric shaft.

11. The apparatus according to claim **10**, wherein the overload coupling has a spring element that is supported on one side on the eccentric shaft and on another side on the adjustment drive.

12. The apparatus according to claim **3**, wherein the adjustment drive is comprises an electric motor.

13. The apparatus according to claim **12**, wherein the electric motor is coupled with a transmission.

14. An apparatus for at least one of toe or camber adjustment for a running gear of a motor vehicle, comprising:

at least one of a tie rod or a link that is fastenable at one side to a bearing fixed with respect to a car body and at another side by a bearing to a wheel carrier of a wheel of the motor vehicle,

one of said bearings has an adjustment element including an eccentric and an eccentric shaft that is adjustable by an adjustment drive, and

safety bearings arranged on both axial sides of the eccentric and axially away from the eccentric are allocated to the eccentric shaft,

wherein the adjustment element includes a two-part split shaft extending along an axis of the eccentric shaft, and the two-part split shaft is located axially outside of the eccentric.

15. The apparatus according to claim **14**, wherein the eccentric shaft is supported in radially spring-mounted roller bearings.

16. The apparatus according to claim **14**, wherein the safety bearings are formed as sliding bearings or rubber bearings.

17. The apparatus according to claim **14**, further comprising an overload coupling arranged between the adjustment drive and the eccentric shaft.

18. The apparatus according to claim 17, wherein the overload coupling has a spring element that is supported on one side on the eccentric shaft and on another side on the adjustment drive.

19. The apparatus according to claim 14, wherein the adjustment drive is comprises an electric motor.

20. The apparatus according to claim 19, wherein the electric motor is coupled with a transmission.

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