Title: Device for automated coupling

International Patent Classification(s):
- B60D 1/64 (2006.01)
- B61G 5/06 (2006.01)
- B60D 1/36 (2006.01)

Application No: 2006201248
Date of Filing: 2006.03.27

Priority Data:
Number: 20 2005 005 676.6
Date: 2005.04.09
Country: DE

Publication Date: 2006.10.26
Publication Journal Date: 2006.10.26
Accepted Journal Date: 2011.03.03

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Related Art:
- DE 299 09 937 U
- DE 1050362 B
Device for automated coupling

Abstract

The invention relates to a device (1) for the automated coupling of electric and/or pneumatic and/or hydraulic connections between a trailer vehicle and a towing vehicle, a coupling mechanism for coupling a trailer vehicle to the towing vehicle being provided, in the case of which device a coupling body with a mouth opening (2), into which a drawbar eye of a drawbar (3) provided on the trailer vehicle can be introduced, and with a coupling bolt which can be actuated for the releasable locking and then reaches through the drawbar eye is provided at the rear of the towing vehicle.

For an automated coupling without manual auxiliary activities, it is intended, for the automated coupling of the electric and/or pneumatic and/or hydraulic connections after a mechanical connection between drawbar eye and mouth opening/coupling bolt has already been produced, for a connecting arm (4) which is arranged in the region of the coupling body, can be pivoted laterally when actuated by a force and, when the trailer vehicle is uncoupled, can be pivoted into a rest position on the rear of the towing vehicle, is to be provided in the region of the coupling body, the end side of the connecting arm (4) having a contact device (5), which interacts with a contact element (6) provided on the drawbar (3), for producing the intended connection by bringing contact element (6) and contact device (5) into contact.
The following statement is a full description of this invention, including the best method of performing it known to me/us:-
Device for automated coupling

Technical Field

The invention relates to a device for the automated coupling of electric and/or pneumatic and/or hydraulic connections between a trailer vehicle and a towing vehicle, a coupling mechanism for coupling a trailer vehicle to the towing vehicle being provided, in the case of which device a coupling body with a mouth opening, into which a drawbar eye of a drawbar provided on the trailer vehicle can be introduced, and with a coupling bolt which can be actuated for the releasable locking and then reaches through the drawbar eye is provided at the rear of the towing vehicle.

Background

Devices of this type are known from practice, in which one part is fitted to the mouth opening and the other part is fitted to the drawbar in such a manner that, during the translatory introduction of the drawbar eye into the mouth opening, the plug-in connection for the electric and/or pneumatic and/or hydraulic line is produced at the same time.

A drawback in this connection is that, either for an automated coupling, the towing vehicle and trailer vehicle have to be oriented very precisely and in alignment corresponding to the orientation of the vehicle or else a manual orientation of the coupling elements has to take place before the connection is produced. However, this again necessitates an outlay on personnel which is to be avoided according to the invention.

It is the object of the invention to substantially overcome or at least ameliorate one or more disadvantages of the prior art, or at least to provide a useful alternative to existing automated coupling mechanisms.

Disclosed herein are automated coupling devices where the respective connection can take place without manual auxiliary activities. This is achieved in that for the automated coupling of the electric and/or pneumatic and/or hydraulic connections after a mechanical connection between drawbar eye and mouth opening/coupling bolt has already been produced, a connecting arm which is arranged in the region of the coupling body, can be pivoted laterally when actuated by a force and, when the trailer vehicle is uncoupled, can be pivoted into a rest position on the rear of the towing vehicle, is provided in the region of the coupling body, the end side of the connecting arm having a contact device, which interacts with a contact element provided on the drawbar, for producing the intended connection by bringing contact element and contact device into
contact, the contact element and the contact device in turn being further connected in each case via corresponding connections. By this means – irrespective of the mechanical loading which by the mechanical coupling of the trailer vehicle to the towing vehicle that is brought about by moving the towing vehicle on to the drawbar of the trailer vehicle – the electric and/or hydraulic and/or pneumatic connection can be produced without excessive mechanical loading, since a rigid connection is already provided.

A device for the automated coupling of one or more connections selected from the group of electric, pneumatic or hydraulic connections between a trailer vehicle and a towing vehicle, the device comprising:

- a contact element arranged on a drawbar of the trailer vehicle, the drawbar including a drawbar eye; and
- a connecting arm arranged on the towing vehicle in the region of a coupling body, the connecting arm including a contact device adapted to interact with the contact element; wherein the connecting arm is adapted to be pivoted laterally when actuated by a force, wherein:
  - the connecting arm is adapted to be pivoted into a rest position on the rear of the towing vehicle when the trailer vehicle is uncoupled; and
  - after a mechanical connection between the drawbar eye and a mouth opening on the coupling body, wherein a coupling bolt is provided which reaches through the drawbar eye for releasable locking of the coupling body to the drawbar, the connecting arm is adapted to be pivoted such that the contact element and contact device are brought into contact for the automated coupling of the one or more connections.

The contact element and/or the contact device may have bevelled side regions for centring purposes, so that even if the contact device does not meet the contact element precisely, for example due to an uneven underlying surface or the like, the connection can be produced correctly.

In particular arrangements, the connecting direction of contact element and contact device may be oriented in accordance with the pivoting direction of the connecting arm, so that an automatic production of the connection takes place at the end of the pivoting movement.

Alternatively, the connecting direction of contact element and contact device may also be oriented orthogonally to the pivoting direction of the connecting arm. In this case, the contact element and/or the contact device may be designed in a manner such that they can be moved towards each other in the connecting direction, so that, in a first step, the
contact device is pivoted towards the contact element and, in a second step, the connection is produced by means of a translatory displacement taking place in the radial direction.

In a further arrangement, the connecting direction of contact element and contact device may be oriented orthogonally to the plane determined by the pivoting direction of the connecting arm. In this case, at least the contact device, in particular the entire connecting arm, may be designed in a manner such that it can be displaced, in particular pivoted, in the connecting direction, so that, likewise in a first step, the contact device is pivoted towards the contact element and, in a second step, the connection can be produced by means of a translatory displacement of contact element and/or contact device or else by means of a corresponding pivoting of the connecting arm in the required direction.

The contact device may be fitted releasably to the connecting arm, so that, in a first step, the connection is produced and then, by release of the contact device from the connecting arm, a pivoting of the connecting arm back into its rest position can take place. As a result, a restricted guiding means is unnecessary, and the connecting arm is not subjected to any mechanical loadings of the connecting arm result.

As an alternative, at least one direction of movement of the connecting arm can be switched to move freely so as to provide free pivotability during the driving mode, so that likewise no mechanical loadings of the connecting arm result.

In a particular arrangement the connecting arm may be provided above or below the coupling body, and the axis of rotation of the drawbar eye and the pivot axis of the connecting arm may be aligned with each other, so that, when the connecting arm is not released, no states of stresses whatsoever can take place due to an uneven displacement of connecting arm and drawbar.

In particular arrangements, the connecting arm may be designed such that it is curved approximately in an S-shaped manner, and, when the connecting arm is pivoted in the rest position, the rear side of the contact device can bear at least approximately against the rear of the towing vehicle, so that even when the axis of rotation of the connecting arm is mounted such that it protrudes at the rear, the correspondingly designed contact device can be arranged in the rest position of the connecting arm in such a manner that it does not protrude, or at least does not protrude further than the connecting device, in relation to the rear of the towing vehicle.

The drive for pivoting the connecting arm may be designed as a rack which can be displaced by actuation by a force and drives a toothed wheel segment which interacts with
the connecting arm and, in particular, is fitted to the connecting arm, with it being possible, in particular, for that end of the connecting arm which is arranged pivotably on the towing vehicle to be designed as the toothed wheel segment.

An angle of rotation sensor may be used to determine the precise orientation of towing vehicle and trailer vehicle before the connecting arm is pivoted, so that a precise activation of the connecting arm can take place and unnecessary loadings in this respect due to the attempt of a further pivoting after the connection is produced are avoided. In this case, the drive may be of hydraulic or pneumatic design, so that, by using the driving resources in any case present on the towing vehicle, a simple drive can take place without an unnecessary mechanism. As an alternative, the drive may also be of electric design.

**Brief Description of the Figures**

Arrangements of the invention which are illustrated in the drawings are explained below:

- **Fig. 1** shows a plan view of a first exemplary embodiment of a device according to the invention for the automated coupling.
- **Fig. 2** shows a side view of the subject matter according to Fig. 1.
- **Fig. 3** shows the subject matter according to Fig. 2 with the connecting arm lowered.
- **Fig. 4** shows the subject matter according to Fig. 3 with the connecting device released.
- **Fig. 5** shows a second exemplary embodiment of a device according to the invention for the automated coupling.
- **Fig. 6** shows a further exemplary embodiment of an embodiment according to the invention for the automated coupling, and
- **Fig. 7** shows a side view of the subject matter according to Fig. 6.

In all of the figur4es, corresponding reference numbers are used for identical or similar components.

**Detailed Description**

Referring to the drawings, Fig. 1 shows a device for the automated coupling of electric and/or pneumatic and/or hydraulic connections (not specifically illustrated in the drawings) between a trailer vehicle and a towing vehicle.

In this case, the towing vehicle is provided with a coupling mechanism for the coupling of a trailer vehicle and a coupling body with a mouth opening 2, into which a drawbar eye of a drawbar 3 provided on the trailer vehicle can be introduced, is provided at the rear of the towing vehicle, with an actuable coupling bolt which then reaches through the drawbar eye being provided for the releasable locking.
The device 1 is designed in such a manner that the connections to be produced take place only after the mechanical connection between drawbar eye and mouth opening 2 and coupling bolt has already been produced. For this purpose, a connecting arm 4, which is arranged in the region of the coupling body and can be pivoted laterally when actuated by a force, is arranged at the rear of the towing vehicle and, when the trailer vehicle is uncoupled, can be pivoted into a rest position on the rear of the towing vehicle.

The connecting arm 4 is then fitted at its one end pivotably on the towing vehicle and, at its other end, a contact device 5 is provided which, interacting with a contact element 6 arranged on the drawbar 3, ensures the connection by contact device 5 and contact element 6 being brought into contact. The contact element 6 and the contact device 5 are in turn in each case connected via corresponding connections (not illustrated in the drawing) to the respective further devices on the trailer vehicle and on the towing vehicle.

As is apparent from Fig. 1, the connecting arm 4 can be pivoted when actuated by a force out of its rest position into a position for producing the connection, with a pneumatic cylinder 7 being provided for this, the said pneumatic cylinder interacting via a rack 8 with a toothed wheel segment 9 on the connecting arm 4.

In the arrangement of the invention that is illustrated in Figs. 1 to 4, in this respect the contact device 5 is pivoted into a position above the contact element 6, and the connection is then produced by lowering of the also vertically pivotable connecting arm 4. In this case, both contact device 5 and contact element 6 have bevelled side edges in order therefore to ensure an automatic centring even when the pivoting has not taken place entirely precisely.

As is apparent from Fig. 4, the contact device 5 is fitted releasably to the connecting arm 4, with it being possible for a corresponding connection 10 to remain as connection between contact device 5 and connecting arm 4 even in the released state.

In the alternative arrangement of the device 1 according to the invention that is illustrated in Fig. 5, the connecting arm 4 is likewise arranged above the mouth opening 2, and the axis of rotation of the drawbar eye and the pivot axis of the connecting arm 4 are likewise aligned with each other.

The connecting arm 4 is designed such that it is curved approximately in an S-shaped manner, and, when the connecting arm 4 is pivoted into its rest position at the rear of the towing vehicle, the rear side of the contact device 5 likewise bears against the rear of the towing vehicle. In this respect, when the connecting arm 4 is restricted, the contact device 5 does not protrude over the rear of the towing vehicle further than the mouth opening 2.
In the further arrangement of a device 1 according to the invention that is illustrated in Figures 6 and 7, the device 1 is arranged below the mouth opening 2. Pivoting of the connecting arm 4 enables the contact device 5 to be pivoted into a position directly in front of the contact element 6. The desired connection is then produced either by means of a translatory displacement of the contact element 6 and/or of the contact device 5. In the arrangement illustrated, the contact element is arranged on the drawbar 3 such that it can be displaced in a translatory manner.
The claims defining the invention are as follows:

1. A device for the automated coupling of one or more connections selected from the group of electric, pneumatic or hydraulic connections between a trailer vehicle and a towing vehicle, the device comprising:
   a contact element arranged on a drawbar of the trailer vehicle, the drawbar including a drawbar eye; and
   a connecting arm arranged on the towing vehicle in the region of a coupling body, the connecting arm including a contact device adapted to interact with the contact element;
   wherein the connecting arm is adapted to be pivoted laterally when actuated by a force, wherein:
   the connecting arm is adapted to be pivoted into a rest position on the rear of the towing vehicle when the trailer vehicle is uncoupled; and
   after a mechanical connection between the drawbar eye and a mouth opening on the coupling body, wherein a coupling bolt is provided which reaches through the drawbar eye for releasable locking of the coupling body to the drawbar, the connecting arm is adapted to be pivoted such that the contact element and contact device are brought into contact for the automated coupling of the one or more connections.

2. The device according to claim 1, wherein either or both of the contact element and the contact device have bevelled side regions for centring purposes.

3. The device according to either claim 1 or claim 2, wherein the connecting direction of contact element and contact device is oriented with respect to the pivoting direction of the connecting arm.

4. The device according to either claim 1 or claim 2, wherein the connecting direction of contact element and contact device is oriented orthogonally to the pivoting direction of the connecting arm.

5. The device according to claim 4, wherein either or both of the contact element and the contact device is designed in a manner such that they can be moved towards each other in the connecting direction.

6. The device according to either claim 1 or claim 2, wherein the connecting direction of contact element and contact device is oriented orthogonally to the plane determined by the pivoting direction of the connecting arm.

7. The device according to claim 6, wherein at least the contact device, in particular the entire connecting arm, is designed such that it can be displaced in the connecting direction.

8. The device according to claim 6, the connecting arm is designed such that it can be pivoted in the connecting direction.

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9. The device according to any one of claims 1 to 8, wherein the contact device is fitted releasably to the connecting arm.

10. The device according to any one of claims 1 to 9, wherein at least one direction of movement of the connecting arm can be switched to move freely to provide free pivotability in the at least one movement direction during a driving mode.

11. The device according to any one of claims 1 to 10, wherein the connecting arm is provided above or below the coupling body, and the axis of rotation of the drawbar eye and the pivot axis of the connecting arm are aligned with each other.

12. The device according to any one of claims 1 to 11, wherein the connecting arm is designed such that it is curved approximately in an S-shaped manner, and, when the connecting arm is pivoted in the rest position, the rear side of the contact device bears at least approximately against the rear of the towing vehicle.

13. The device according to any one of claims 1 to 12, further comprising a drive for pivoting the connecting arm, wherein the drive is designed as a rack which can be displaced by actuation by a force and which drives a toothed wheel segment which interacts with the connecting arm.

14. The device according to claim 13 wherein the drive is fitted to the connecting arm.

15. The device according to any claim 13 or claim 14, wherein the drive is of hydraulic or pneumatic design.

16. The device for the automated coupling of electric and/or pneumatic and/or hydraulic connections between a trailer vehicle and a towing vehicle, said device substantially as hereinbefore described with reference to Figs 1 to 4, Fig 5, or Figs 6 and 7 of the accompanying drawings.

Dated 20 December, 2010

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