(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 August 2015 (27.08.2015)

WIPO | PCT

(10) International Publication Number
WO 2015/124281 A1

(51) International Patent Classification:
B62D 35/00 (2006.01)

(21) International Application Number:
PCT/EP2015/000321

(22) International Filing Date:
13 February 2015 (13.02.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1402962.3 20 February 2014 (20.02.2014) GB

(71) Applicant: **DAIMLER AG** [DE/DE]; Mercedesstrasse 137, 70327 Stuttgart (DE).

(72) Inventors: **LEE, Joon-Ho**; 17178 NW Mesa View Ln, Beaverton, OR 97006 (US). **DAWSON, Michael**; 3605 SE Dodge Park Blvd, Boring, OR 97009 (US). **MEYER, David, Jr.**; 3536 NE 131st Pl, Portland, OR 97230 (US). **RINEHART, Dawn**; 6966 N Oatman Ave, Portland, OR 97217 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: BUMPER ASSEMBLY FOR A COMMERCIAL VEHICLE

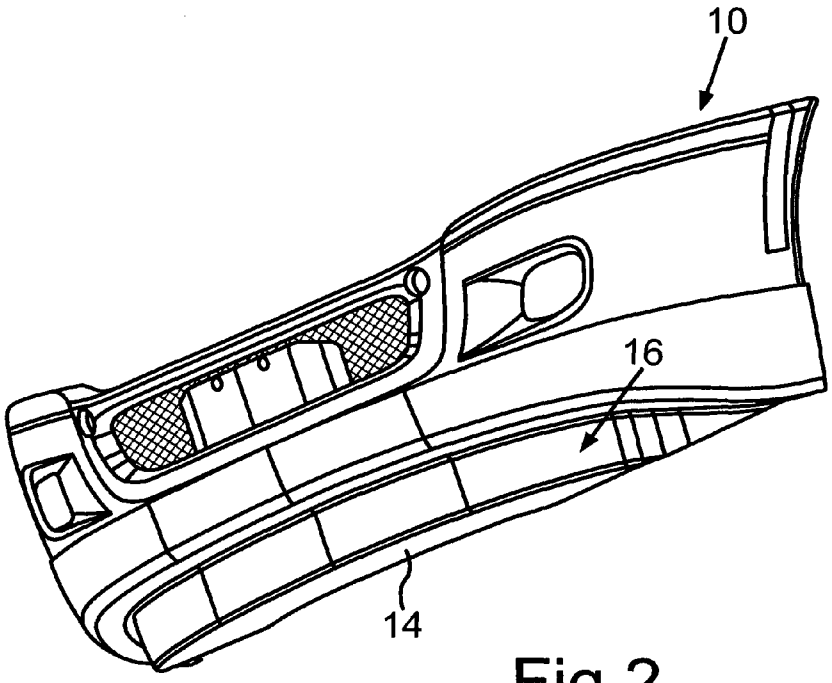

Fig.2

(57) **Abstract**: The invention relates to a bumper assembly (10) for a commercial vehicle, the bumper assembly (10) comprising at least one front bumper panel (12) configured to be arranged at a front end of the commercial vehicle, wherein the bumper assembly (10) comprises at least one second front bumper panel (14) being movable in relation to the first front bumper panel (12) between a retracted position in which at least a portion (16) of the second front bumper panel (14) is covered by the first front bumper panel (12) in the longitudinal direction of the vehicle and at least one use position in which the portion (16) is uncovered.

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Bumper Assembly for a Commercial Vehicle

The invention relates to a bumper assembly for a commercial vehicle according to the preamble of patent claim 1.

Such a bumper assembly for a commercial vehicle can be found in US 2008/0303309 A1. The bumper assembly comprises at least one front bumper panel configured to be arranged at a front end of the commercial vehicle.

It is an object of the present invention to provide a bumper assembly of the aforementioned kind, by means of which bumper assembly particularly advantageous aerodynamics as well as a particularly advantageous usability of the commercial vehicle can be realized.

This object is solved by a bumper assembly having the features of patent claim 1. Advantageous embodiments with expedient and non-trivial developments of the invention are indicated in the other patent claims.

In order to provide a bumper assembly of the kind indicated in the preamble of patent claim 1, by means of which bumper assembly particularly advantageous aerodynamics as well as a particularly advantageous usability of the commercial vehicle can be realized, according to the present invention, the bumper assembly comprises at least one second front bumper panel being moveable between a retracted position and at least one use position in relation to the first front bumper panel. In the retracted position, at least a portion of the second front bumper panel is covered by the first front bumper panel in the longitudinal direction of the vehicle. For example, in the retracted position, the portion of the second front bumper panel is overlapped by the first front bumper panel in the longitudinal direction of the vehicle towards the front.

In the use position, the portion is uncovered. This means the portion is not overlapped by the first bumper panel in the use position. Preferably, the second front bumper panel is

moveable downwards from the retracted position into the use position in the vertical direction of the vehicle.

In the use position, the second front bumper panel acts as an air dam which reduces the drag of the commercial vehicle at highway speeds in comparison with the second front bumper panel being in the retracted position. As a result of the drag reduction, a fuel economy improvement can be realized. In other words, by lowering the second front bumper panel from the retracted position into the use position, the fuel economy of the commercial vehicle at highway speeds can be improved since air is directed away from underbody components by the second front bumper panel being lowered and, thus, being in the use position.

However, if the commercial vehicle needs to be driven up a ramp, the second front bumper panel can be raised and, thus, moved from the use position into the retracted position so that a collision between the second front bumper panel and the ramp can be avoided. This means the second front bumper panel can be moved between the use position and the retracted position in a need-based manner so that both a particularly advantageous usability and particularly advantageous aerodynamics of the commercial vehicle can be realized. By raising the second front bumper panel from the use position into the retracted position, damages of the second front bumper panel can be avoided.

Further advantages, features, and details of the invention result from the following description of a preferred embodiment as well as from the drawings. The features and feature combinations mentioned in the description as well as the features and feature combinations mentioned in the following description of the figures and/or shown in the figures alone can be employed not only in the respective indicated combination but also in any other combination or taken alone without leaving the scope of the invention.

The drawings show in:

Fig. 1 a schematic perspective view of a bumper assembly for a commercial vehicle, the bumper assembly comprising a first front bumper panel and a second front bumper panel which is in its retracted position;

Fig. 2 a schematic perspective view of the bumper assembly with the second front bumper panel being in its use position;

Fig. 3 a schematic perspective view of the second front bumper panel; and

Fig. 4 part of a schematic side view of the commercial vehicle comprising the bumper assembly.

Fig. 1 shows a bumper assembly 10 in the form of a front bumper assembly for a commercial vehicle, in particular, a truck. The bumper assembly 10 comprises a first front bumper panel 12 which is made of, for example, a plastic material. Moreover, the front bumper panel 12 can be inherently stable. The first front bumper panel 12 is configured to be arranged at a front end of the commercial vehicle. For example, the first front bumper panel 12 is used to cover a cross member of the truck in the longitudinal direction of the vehicle towards the front.

As can be seen from Figs. 1 and 2, the bumper assembly 10 further comprises a second front bumper panel 14 which can be formed in one piece. For example, the second front bumper panel 14 can be made of a plastic material. Moreover, the second front bumper panel 14 can be inherently stable. Moreover, the second front bumper panel 14 can be elastic.

As can be seen from Figs. 1 and 2, the second front bumper panel 14 is moveable in relation to the first front bumper panel 12 between a retracted position shown in Fig. 1 and at least one use position shown in Fig. 2. In the retracted position, at least a portion 16 of the second front bumper panel 14 is covered by the first front bumper panel 12 in the longitudinal direction of the vehicle. In the use position, the portion 16 is uncovered. In the retracted position, the portion 16 is covered by the first front bumper panel 12 in the longitudinal direction of the vehicle towards the front. In the use position, the second front bumper panel 14 is lowered with respect to the retracted position so that the portion 16 is not covered by the first front bumper panel 12.

The second front bumper panel 14 is moveable downwards from the retracted position into the use position into the vertical direction of the vehicle and in relation to the first front bumper panel 12. By lowering the second front bumper panel 14 from the retracted position into the use position, the drag of the truck can be reduced in comparison with the retracted position. Thus, the fuel economy can be improved.

Fig. 4 shows a longitudinal member 18 of a frame of the truck as well as a front wheel 20 of the truck. The bumper assembly 10 is mounted at least indirectly on the frame. Moreover, Fig. 4 shows a ground 22 on which the truck can be driven.

The front wheel 20 comprises a tire 24 and a rim 26 on which the tire 24 is mounted. In Fig. 4, a distance between the ground 22 and the rim 26 is designated with D1. When the second front bumper panel 14 is in the retracted position, the truck has a first ground clearance G1. This means the first ground clearance G1 is a first distance between the bumper assembly 10 and the ground 22 with the second front bumper panel 14 being in the retracted position. In the use position, the truck has a second ground clearance G2. The second ground clearance G2 is a distance between the ground 22 and the bumper assembly 10 with the second front bumper panel 14 being in the use position. As can be seen from Fig. 4, the second ground clearance G2 is less than the first ground clearance G1. This means that the ground clearance of the truck is decreased by lowering the second front bumper panel 14 from the retracted position into the use position. However, this also means that the ground clearance of the truck can be increased by raising the second front bumper panel 14 from the use position into the retracted position.

Fig. 4 also shows a ramp 28 extending at an angle of 15° in relation to the ground 22. If the truck needs to be driven up the ramp 28, the second front bumper panel 14 can be raised from the use position into the retracted position so that a collision between the second front bumper panel 14 and the ramp 28 and, thus, damages of the second front bumper panel 14 can be avoided. Thus, the second front bumper panel 14 can be moved in relation to the first front bumper panel 12 between the use position and the retracted position in a need-based manner.

For example, the bumper assembly 10 comprises at least one actuator configured to move the second front bumper panel 14. Preferably, the actuator is configured as a pneumatic actuator so that the second front bumper panel 14 can be moved between the retracted position and the use position by means of air, in particular, pressurized air. Other well known actuating means can be employed to raise or lower the second front bumper panel 14 such as hydraulic, mechanical or electrical means. Moreover in the present pneumatic example, the bumper assembly 10 can comprise at least one valve element configured to control an airflow provided by the actuator thereby controlling the movement of the second front bumper panel 14. For example, the bumper assembly 10 can comprise at least one air solenoid valve, at least one flow regulator valve, at least one air regulator valve, at least one pressure switch and at least one hinge used to realize the

movement of the second front bumper panel 14 in relation to the first bumper panel 12. Preferably, said valves, the switch and the flow regulator valve are arranged within the bumper assembly 10. For example, said components can be arranged on at least one of the front bumper panels 12 and 14.

Fig. 3 shows the second front bumper panel 14. As can be seen from Fig. 3, a steel reinforcement 30 is provided, the steel reinforcement 30 being bonded to the second front bumper panel 14. For example, the second front bumper panel 14 is configured as a moulded, flexible tray. The steel reinforcement 30 is configured to support an upper flange of said tray.

The steel reinforcement 30 has lateral mounting elements 32 by means of which the steel reinforcement and, thus, the second front bumper panel 14 are connected to the pneumatic actuator.

For example, the second front bumper panel 14 is deployed and, thus, lowered from the retracted position into the use position automatically once the truck maintains a speed above a predeterminable threshold which is, for example, 45 mph for a predefined time duration. In the use position, the second front bumper panel 14 acts as an air dam directing oncoming air away from underbody components.

For example, the air dam (second front bumper panel 14) is automatically retracted at a lower set point speed. For example, the air dam is raised from the use position into the retracted position once the truck goes below 25 mph for a predefined time duration. Both set speeds and time durations are software configurable.

Claims

1. A bumper assembly (10) for a commercial vehicle, the bumper assembly (10) comprising at least one front bumper panel (12) configured to be arranged at a front end of the commercial vehicle,
characterized in that
the bumper assembly (10) comprises at least one second front bumper panel (14) being movable in relation to the first front bumper panel (12) between a retracted position in which at least a portion (16) of the second front bumper panel (14) is covered by the first front bumper panel (12) in the longitudinal direction of the vehicle and at least one use position in which the portion (16) is uncovered.

2. The bumper assembly (10) according to claim 1,
characterized in that,
the second front bumper panel (16) is movable downwards from the retracted position into the use position in the vertical direction of the vehicle.

3. The bumper assembly (10) according to any one of claims 1 or 2,
characterized in that
the bumper assembly (10) comprises at least one actuator configured to move the second front bumper panel (14).

4. The bumper assembly (10) according claim 3,
characterized in that
the actuator is configured as a pneumatic actuator.

5. The bumper assembly (10) according to claim 4,
characterized in that
the bumper assembly (10) comprises at least one valve element configured to control an airflow provided by the actuator thereby controlling the movement of the second front bumper panel (14), the valve element being arranged on at least one of the front bumper panels (12, 14).

6. The bumper assembly (10) according to any one of the preceding claims,
characterized in that
the second front bumper panel (14) is inherently stable.

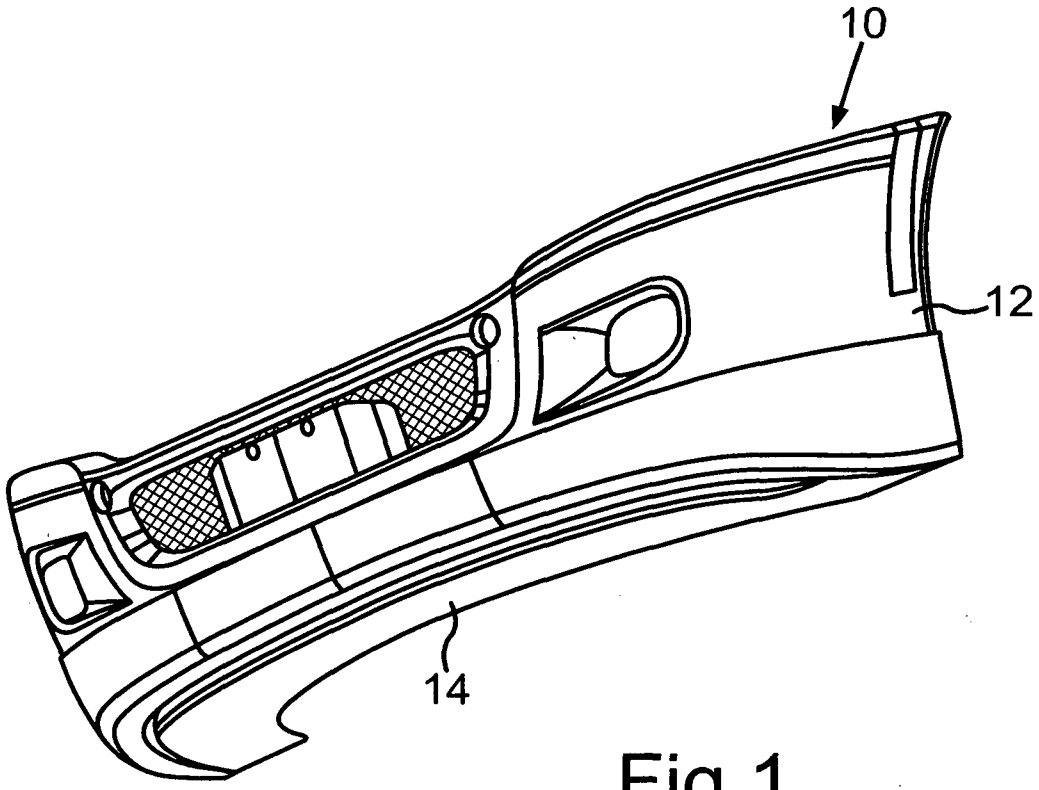

Fig.1

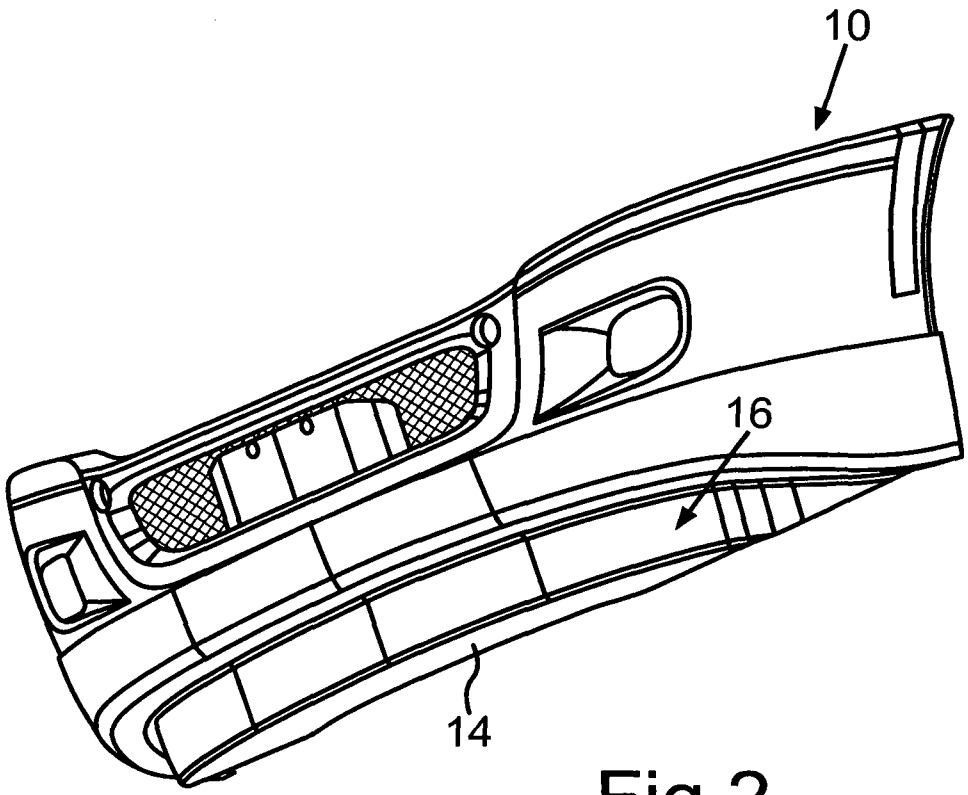

Fig.2

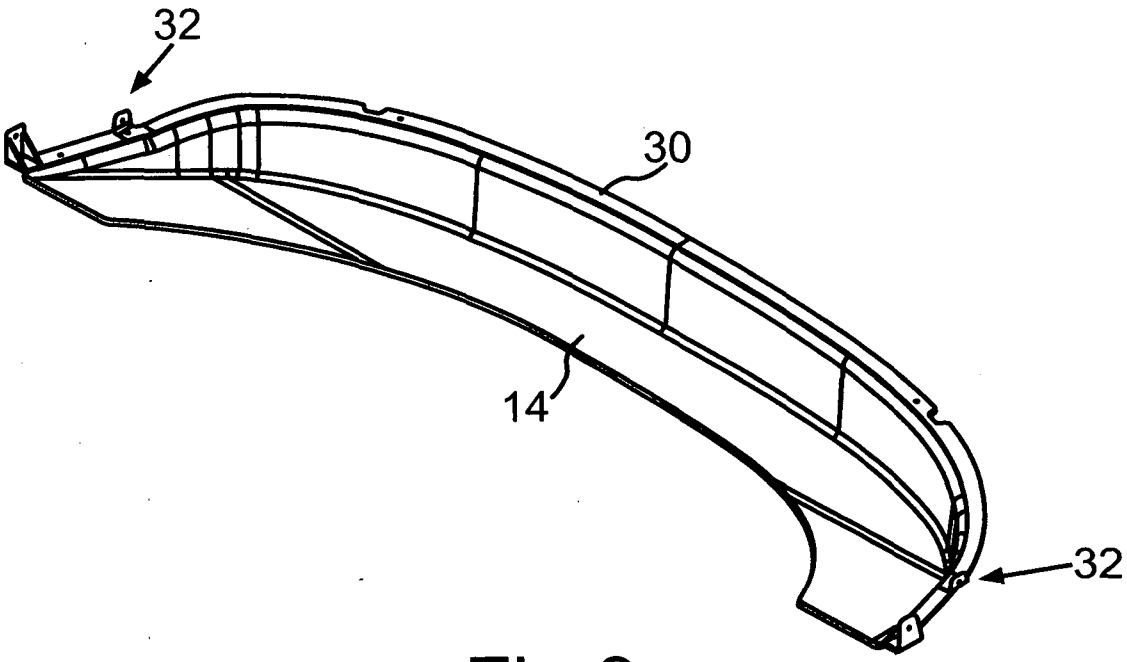

Fig.3

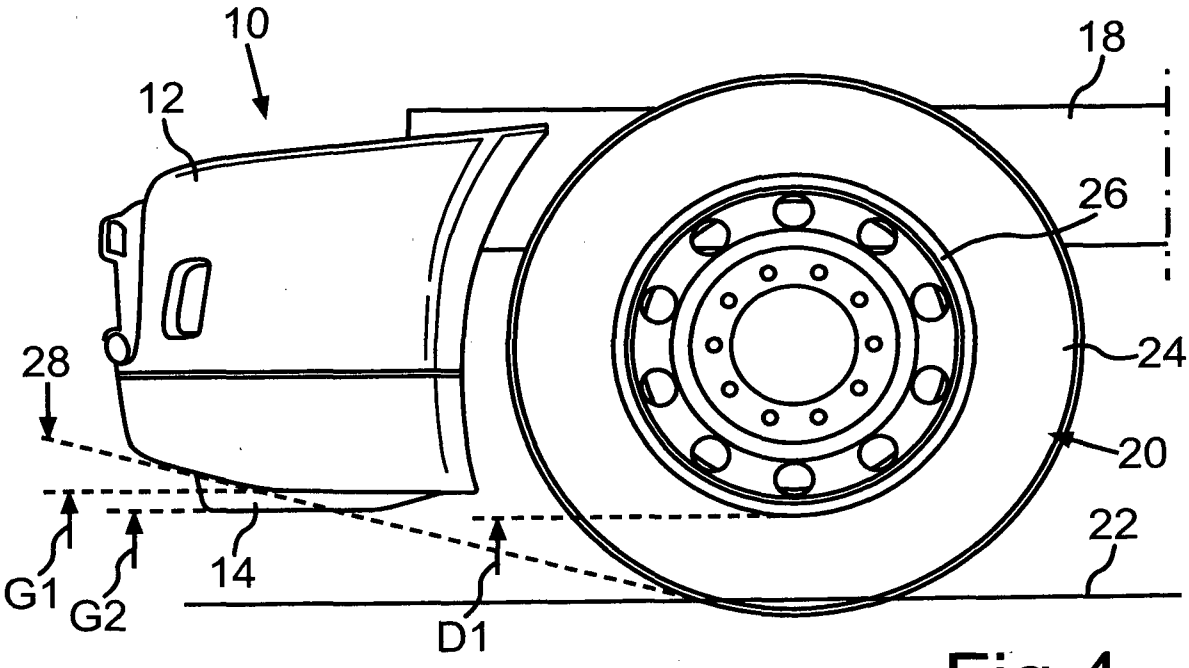

Fig.4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/000321

A. CLASSIFICATION OF SUBJECT MATTER
INV. B62D35/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B62D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 079 769 A (FANNIN DAWN B [US] ET AL) 27 June 2000 (2000-06-27) columns 5-10; figures 1-9	1-6
X	US 5 458 391 A (ITO NOBUO [JP] ET AL) 17 October 1995 (1995-10-17) columns 2-3; figures 2-3	1-3,6
X	WO 2007/047022 A2 (GM GLOBAL TECH OPERATIONS INC [US]) 26 April 2007 (2007-04-26) figures 1-5	1-3,6
X	FR 2 948 916 A1 (PEUGEOT CITROEN AUTOMOBILES SA [FR]) 11 February 2011 (2011-02-11) pages 3-5; figures 2-5	1-3,6

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 May 2015	28/05/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Szaip, András

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/000321

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/140976 A1 (BROWNE ALAN L [US] ET AL) 10 June 2010 (2010-06-10) paragraphs [0040] - [0077]; figures 1-6 -----	1-3
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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