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(54) Title: A FIXATION ARRANGEMENT

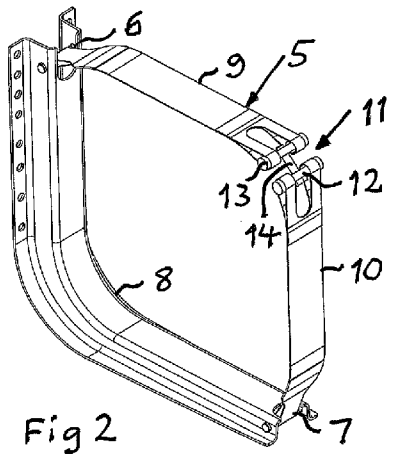

Fig 2

(57) Abstract: An arrangement for fixation of one or more objects comprises a strap (5) having opposite ends (6, 7) connected to a supporting body (8) to which the objects are to be fixed by tightening the strap therearound. A strap tightening assembly comprises a couple of two pins (12, 13) spaced apart and extending transversely to the longitudinal extension of the strap and in parallel with the strap and a member (14) creating an interconnection of the pins and configured to be acted upon for tightening the strap around said objects by reducing the distance separating the pins. The assem- bly has a hinge in said interconnection allowing the pins to tilt with respect to each other.

A fixation arrangement

TECHNICAL FIELD OF THE INVENTION

The present invention relates to an arrangement for fixation of one or more objects comprising

- a strap configured to have opposite ends thereof connected to a supporting body to which said objects are to be fixed by tightening the strap therearound, and
- a strap tightening assembly comprising a couple of two pins spaced apart and extending transversely to the longitudinal extension of the strap and in parallel with the strap and a member creating an interconnection of the pins and configured to be acted upon for tightening the strap around said objects by reducing the distance separating the pins.

Such arrangements may for example be used to fixate objects to a chassis fixed part of a motor vehicle, especially a heavy motor vehicle, such as a truck, a lorry or a bus, which is the reason for below discussing the invention and the problem to be solved thereby for such a use for illuminating the invention but accordingly not restrict it to that application. Thus, opposite ends of the strap may be connected to any supporting body and fix any object thereto by tightening of the strap therearound.

Furthermore, the strap may have more than one part forming the strap by being connected in series between said opposite ends of the strap.

BACKGROUND ART

An arrangement of the type defined above is known through for example CN 103909822. A known such arrangement is used to fixate fuel storage tanks, for example containing diesel or gas fuel, to L-shaped brackets secured to the chassis of motor vehicles in the form of trucks. In such a known arrangement the strap has two parts interconnected by a said assembly for tightening the strap by actuating a said member in the form of a bolt interconnecting the two pins of the two strap parts. The bolt extends through through-holes in the two pins, in which one of the pins has a through-hole with a diameter exceeding the diameter of the bolt and the other has a through-hole provided with an internal thread with which the thread of the bolt engages. The bolt may not be tightened so that the pins come to bear against each other so as to be able to ensure a required tightening and jamming force of the strap in spite of tolerances existing. It is of course crucial to prevent that the package of fuel storage tanks may not come loose from the brackets, since that would constitute a danger to the environment as a consequence of the inflammable content and the high pressure thereof in the case of gas fuel.

However, would the speed of the truck in the driving direction change rapidly, for example owing to a collision, the package of fuel storage tanks will owing to inertia be thrown away and the bracket and the strap will then be twisted for keeping said package fixed to the bracket. This would then result in a bending force applied to the bolt since the bolt has not been tightened to make the pins bearing against each other, and the bolt is not made to with-

stand the bending thereof then resulting, so that there is an imminent risk of a breaking of the bolt so that the fuel storage tank package will come loose from the truck.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an arrangement of the type defined in the introduction being improved in at least some aspect with respect to such arrangements already known.

This object is according to the invention obtained by providing such an arrangement with the features listed in the characterizing part of appended patent claim 1.

The hinge in the interconnection of the pins allowing the pins to tilt with respect to each other in a plane in parallel with large flat surfaces of the strap and the provision of the strap with a stiffness enabling a bending thereof in the plane of said tilting to a degree corresponding to said tilting enables a said tilting of the pins with respect to each other without applying bending forces on said member, such as a bolt, creating said interconnection, so that this member will not be bent and broken even if high forces are applied on the strap and by that on said assembly, such as in the case of fixation of objects to a chassis fixed part of a motor vehicle through heavy accelerations or retardations of the vehicle.

According to an embodiment of the invention the strap comprises at least two parts interconnected by a said assembly by each having one pin of a said couple at an end of the strap part adjacent to the end of the other strap part and a said member interconnecting

these pins. Such a location of the assembly may be advantageous for providing desired access to act upon said member for tightening the strap around an object.

According to another embodiment of the invention the arrangement comprises a said assembly at at least one of the ends of the strap connected to said supporting body with said strap end provided with one pin of a said couple and the other pin of the couple connected to the supporting body and a said member interconnecting these two pins. Such a location of a said assembly may in some applications of an arrangement according to the invention be preferred, and it is also possible to combine such a location with a location of another assembly between two strap parts and/or having a said assembly at each end of the strap for enabling tightening of the strap by acting on a said member at more than one location.

According to another embodiment of the invention said member of said assembly comprises a bolt. A bolt, which is here to be interpreted as an elongated element with an external thread and accordingly comprising among others a conventional screw, is a suitable choice for a member used to tightening the strap by reducing the distance separating the pins when acted upon.

According to another embodiment of the invention the two pins of a said couple are provided both with a through-hole with a diameter exceeding the diameter of the bolt, the bolt extends through the through-holes of both pins and has a head thereof received in a seat formed around the through-hole in a first of said pins by means of a first nut with a through-hole of a diameter exceeding the diameter of the bolt and has a second nut received in a seat

formed around the through-hole in a second of the pins and provided with an internal thread engaging with an external thread of the bolt, and the first and second nuts have profiles adapted to the profiles of the seats of the respective pin so as to make said nuts turning in said seats by tilting of said pins without applying bending forces upon said bolt. This constitutes a simple and reliable way of providing said assembly with a hinge in the interconnection of the pins.

According to another embodiment of the invention constituting a further development of the embodiment last mentioned said through-holes are slotted, said seats are cylindrical and formed by the slotted through-holes, and the first and second nuts have profiles adapted to the profiles of the seats of the respective pin so as to make said nuts turning in said seats by tilting of said pins without applying bending forces upon said bolt. Such a design of the bolt with nuts with cylindrical seats will then also provide a steady holder-on for tightening the bolt.

According to another embodiment of the invention the two pins have a convex shape by an enlarged cross-section around said through-holes forming said seats, and the first and second nuts have profiles adapted to the profiles of said seats on the respective pin so as to make said nuts turning in said seats by tilting of said pins without applying bending forces upon said bolt. This constitutes another possible simple and reliable way of realising a hinge in the interconnection of the pins of said assembly.

According to another embodiment of the invention the arrangement is configured to have said strap connected to a supporting member

in the form of a vehicle chassis fixed part, and the arrangement may then have a strap connected to a supporting body in the form of an L-shaped bracket secured to the chassis of a vehicle. Such an arrangement is suitable to be used to fixate an object to a vehicle, such as a fuel tank to a motor vehicle, especially a heavy motor vehicle, such as a truck or a bus.

According to another embodiment of the invention the arrangement is configured to fixate elongated gas storage tanks to the chassis of a vehicle.

The invention also relates to a use of an arrangement according to the invention to fixate one or more objects to a vehicle chassis fixed part, and especially a fuel tank to a motor vehicle. The invention also relates to a motor vehicle, especially a heavy motor vehicle, such as a truck or a bus, which is provided with at least one arrangement for fixation of at least one object to a chassis fixed part of the vehicle. The advantages of such a use and motor vehicle appear clearly from the above discussion of an arrangement according to the invention and embodiments thereof.

Other advantageous features as well as advantages of the present invention appear from the description following below.

BRIEF DESCRIPTION OF THE DRAWINGS

With reference to the appended drawings, below follows a specific description of embodiments of the invention cited as examples.

In the drawings:

Fig 1 is a schematic view illustrating how an arrangement according to the present invention may be used for fixation of gas fuel tanks to a chassis fixed part of a heavy motor vehicle in the form of a truck,

Fig 2 is a perspective view of an arrangement of the type to which the present invention is directed,

Fig 3 is a perspective view of a pin of an assembly of an arrangement according to a first embodiment of the invention,

Figs 4 and 5 are views illustrating a said assembly of an arrangement according to the first embodiment of the invention,

Figs 6 and 7 are views illustrating an assembly of an arrangement according to a second embodiment of the invention, and

Figs 8-10 are views illustrating an assembly of an arrangement according to a third embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Fig 1 illustrates very schematically a possible use of an arrangement 1 according to the present invention for fixation of objects in the form of gas fuel tanks 2 to the chassis 3 of a motor vehicle 4

in the form of a truck. It is pointed out that a number of components of the vehicle have been omitted, since they have nothing to do with the present invention directed to said arrangement for fixation of objects.

The general structure of an arrangement of the type to which the arrangement of the present invention belongs is illustrated in fig 2. This arrangement comprises a strap 5 configured to have opposite ends 6, 7 thereof connected to a supporting body in the form of an L-shaped bracket 8 to be secured to the chassis of a vehicle. The strap has two parts 9, 10 interconnected by an assembly 11 comprising a couple of two pins 12, 13, secured to an end of the respective strap part by being received in a strap end loop, spaced apart and extending transversely to the longitudinal extension of the strap and in parallel with the strap and a member 14, here a bolt, creating an interconnection of the pins and configured to be acted upon for tightening the strap around an object embraced by the strap and the bracket by reducing the distance separating the pins 12, 13.

The design of an assembly of an arrangement according to a first embodiment of the invention will now be described while making reference to figs 3-5. The two pins 12, 13 are both provided with a slotted through-hole 15 with a diameter exceding the diameter of a bolt 16 forming a said member and extending through the through-holes of both pins. The bolt 16 has a head 17 received in a cylindrical seat 18 formed by the slotted through-hole in a first 12 of the pins by means of a first nut 19 with a through-hole of a diameter exceding the diameter of the bolt and has a second nut 20 received in a cylindrical seat formed by the slotted through-hole

in a second 13 of the pins and provided with an internal thread engaging with an external thread of the bolt. The first and the second nuts 19, 20 have cylindrical profiles corresponding to the profiles of the cylindrical seats in the respective pin so as to make these nuts turning in said seats by tilting of the pins without applying bending forces upon the bolt as shown in fig 5. Thus, when applied between the two strap parts 9, 10 of a strap shown in fig 2 such a strap may be tightened by turning the bolt 16 so as to reduce the distance between the two pins 12, 13. Bending forces applied to the strap by abrupt speed changes of the vehicle will result in a bending of the strap in a plane in parallel with large flat surfaces of the strap and by that tilting of the pins as shown in fig 5 without application of any bending forces upon the bolt 16, so that the interconnection of the two pins is provided with a hinge.

Figs 6 and 7 illustrate an assembly 11' of an arrangement according to a second embodiment of the invention different from the one shown in fig 5 by the fact that the two pins 12', 13' have a portion 21 with an enlarged cross-section around the through-hole forming a seat 22. It is shown how the first 19' and second 20' nuts have profiles corresponding to the profiles of the seats on the respective pin so as to make the nuts turning in/on said seats by tilting of the pins 12', 13' without applying bending forces upon the bolt 16'. Fig 7 shows how the pins have been tilted with respect to each other without for that sake applying any bending force upon the bolt 16'.

Figs 8-10 illustrate an assembly 11'' being a part of an arrangement according to a third embodiment of the invention differing from the one shown in figs 3-5 by having a bolt 16'' without any head and having a thread at each end engaging the internal thread

of a nut so as to reduce the distance between the two pins 12'', 13'' by turning the bolt. Furthermore, the bolt 16'' is divided into two parts 16a, 16b interconnected by a hinge 23 enabling these parts to pivot with respect to each other when the pins 12'', 13'' tilt with respect to each other as shown in fig 10.

The invention is of course in no way restricted to the embodiments described above, since many possibilities for modifications thereof are likely to be obvious to one skilled in the art without having to deviate from the scope of invention defined in the appended claims.

The arrangement may as already mentioned have a plurality of said assemblies, and the pins of the assemblies have not to have a circular cross-section but any elongated element with any cross-section is conceivable, although a circular or elliptical cross-section may be preferred for facilitating turning of the pin in a strap loop receiving the pin.

Claims

1. An arrangement for fixation of one or more objects (2) comprising
   - a strap (5) configured to have opposite ends (6, 7) thereof connected to a supporting body (3, 8) to which said objects are to be fixed by tightening the strap therearound, and
   - a strap tightening assembly (11, 11', 11'') comprising a couple of two pins (12, 13, 12', 13', 12'', 13'') spaced apart and extending transversely to the longitudinal extension of the strap (5) and in parallel with large flat surfaces of the strap and a member (16, 16', 16'') creating an interconnection of the pins and configured to be acted upon for tightening the strap around said objects by reducing the distance separating the pins,

   characterized in that said assembly (11, 11', 11'') comprises a hinge in said interconnection configured to allow said pins (12, 13, 12', 13', 12'', 13'') to tilt with respect to each other in a plane in parallel with large flat surfaces of the strap (5), and that the strap has a stiffness enabling a bending thereof in the plane of said tilting to a degree corresponding to said tilting.

2. An arrangement according to claim 1, **characterized** in that said strap (5) comprises at least two parts (9, 10) interconnected by a said assembly (11, 11', 11'') by each having one pin of a said couple at an end of the strap part adjacent to the end of the other strap part and a said member (16, 16', 16'') interconnecting these pins.

3. An arrangement according to claim 1 or 2, **characterized** in that it comprises a said assembly (11, 11', 11'') at at least one of the ends of the strap connected to said supporting body (3, 8) with said strap end (6, 7) provided with one pin of a said couple and the other pin of the couple connected to the supporting body and a said member (16, 16', 16'') interconnecting these two pins.

4. An arrangement according to any of the preceding claims, **characterized** in that said member of said assembly (11, 11', 11'') comprises a bolt (16, 16', 16'').

5. An arrangement according to claim 4, **characterized** in that the two pins (12, 13, 12', 13') of a said couple are provided both with a through-hole (15) with a diameter exceeding the diameter of the bolt (16, 16'), that the bolt extends through the through-holes of both pins and has a head (17, 17') thereof received in a seat formed around the through-hole (15) in a first (12, 12') of said pins by means of a first nut (19, 19') with a through-hole of a diameter exceeding the diameter of the bolt and has a second nut (20, 20') received in a seat formed around the through-hole in a second (13, 13') of the pins and provided with an internal thread engaging with an external thread of the bolt, and that the first (19, 19') and second nuts (20, 20') have profiles adapted to the profiles of the seats of the respective pin so as to make said nuts turning in said seats by tilting of said pins without applying bending forces upon said bolt.

6. An arrangement according to claim 5, **characterized** in that said through-holes (15) are slotted, that said seats (18) are cylindrical and formed by the slotted through-holes, and that the first (19) and second (20) nuts have profiles adapted to the profiles of the seats of the respective pin (12, 13) so as to make said nuts turning in said seats by tilting of said pins without applying bending forces upon said bolt (16).

7. An arrangement according to claim 5, **characterized** in that the two pins (12', 13') have a convex shape by an enlarged cross-section around said through-holes forming said seats (22), and that the first (19') and second (20') nuts have profiles adapted to the profiles of said seats on the respective pin so as to make said nuts turning in said seats by tilting of said pins without applying bending forces upon said bolt (16').

8. An arrangement according to any of the preceding claims, **characterized** in that it is configured to have said strap (5) connected to a supporting body (3) in the form of a vehicle chassis fixed part.

9. An arrangement according to claim 8, **characterized** in that it is configured to have said strap (5) connected to a supporting body in the form of an L-shaped bracket (8) secured to the chassis (3) of a vehicle (4).

10. An arrangement according to claim 8 or 9, **characterized** in that it is configured to fixate a fuel tank (2) to a motor vehicle (4), especially a heavy motor vehicle, such as a truck or a bus.

11. An arrangement according to claim 10, **characterized** in that it is configured to fixate elongated gas storage tanks (2) to the chassis (3) of a vehicle (4).

12. Use of an arrangement according to any of the preceeding claims to fixate one or more objects (2) to a vehicle chassis (3) fixed part.

13. A motor vehicle, especially a heavy motor vehicle, such as a truck or a bus, **characterized** in that it is provided with at least one arrangement (1) according to any of claims 1-11 for fixation of at least one object to a chassis fixed part of the vehicle.

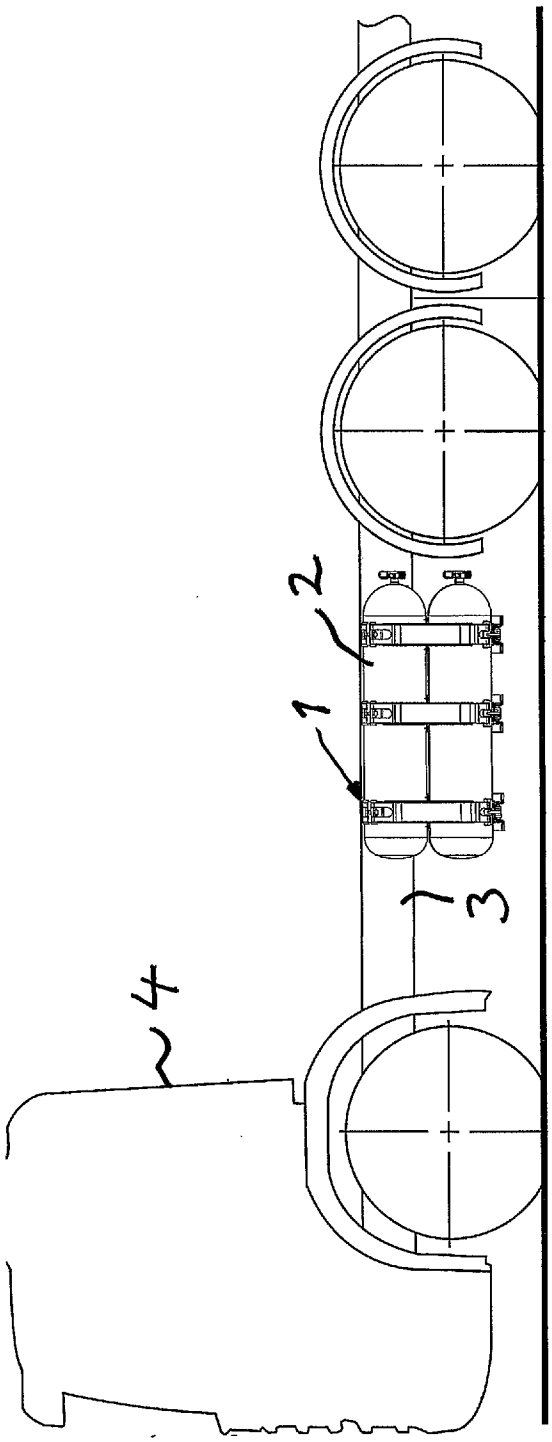

Fig 1

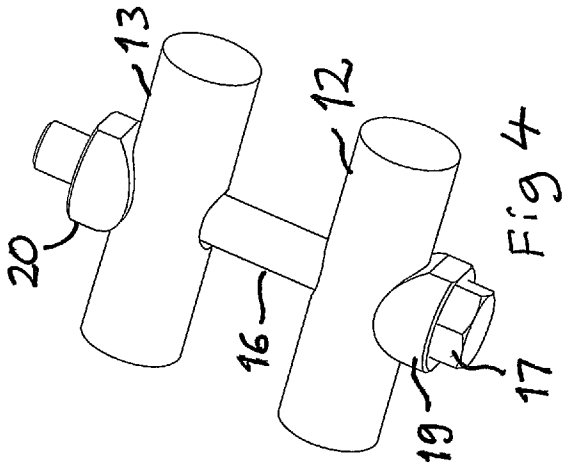

Fig 4

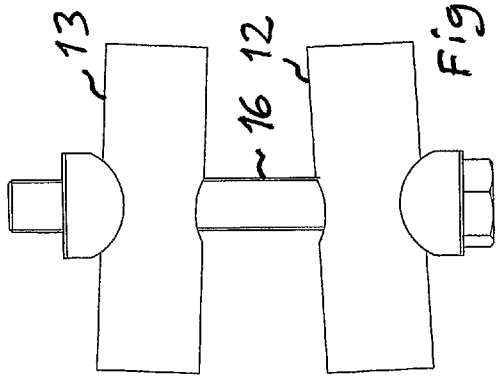

Fig 5

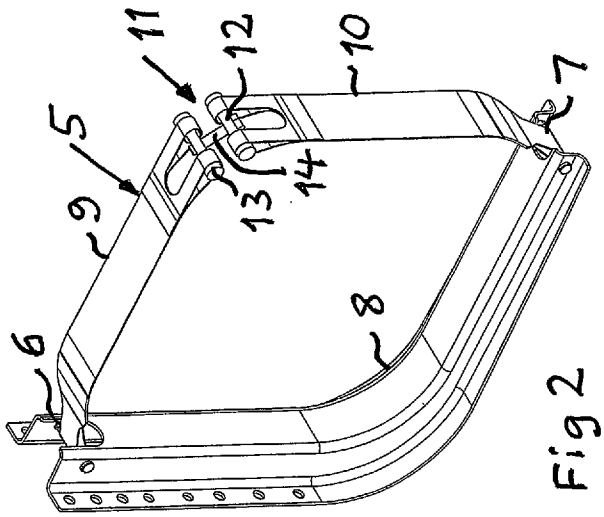

Fig 2

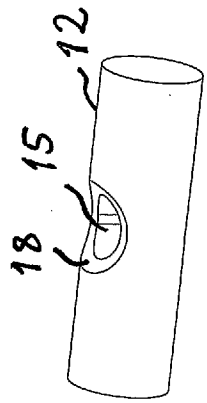

Fig 3

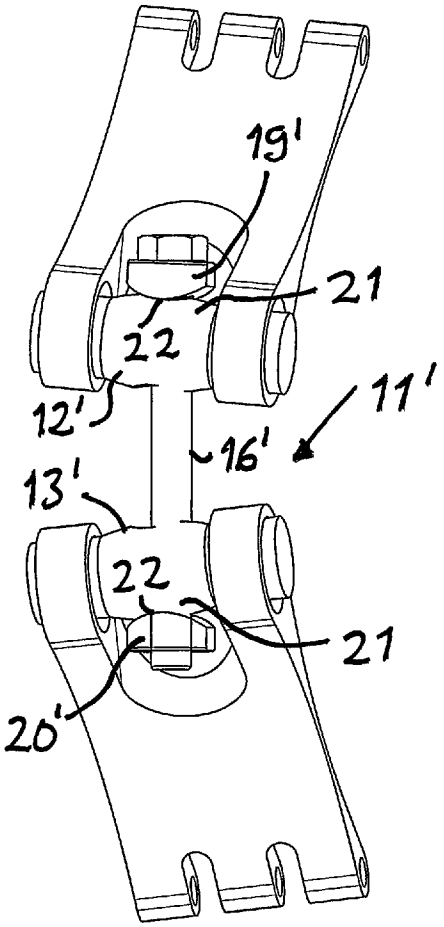

Fig 6

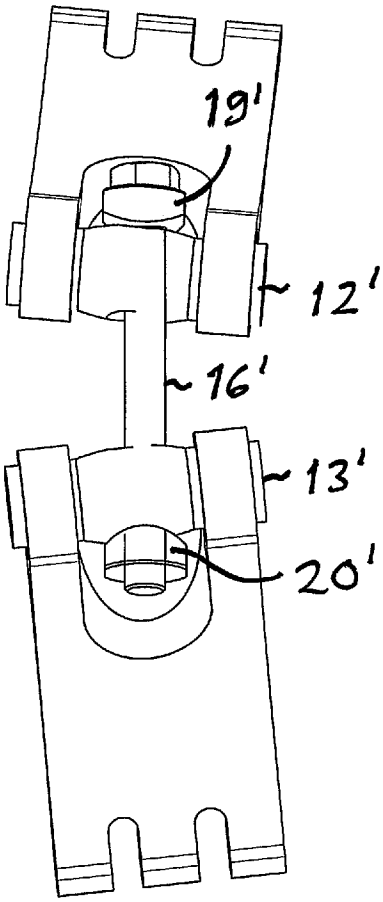

Fig 7

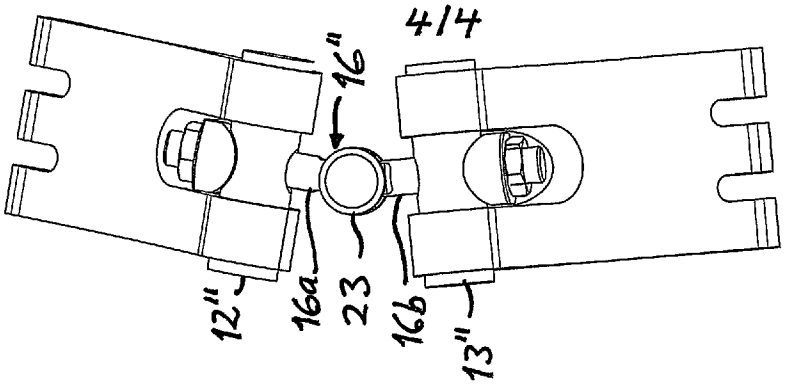

Fig 10

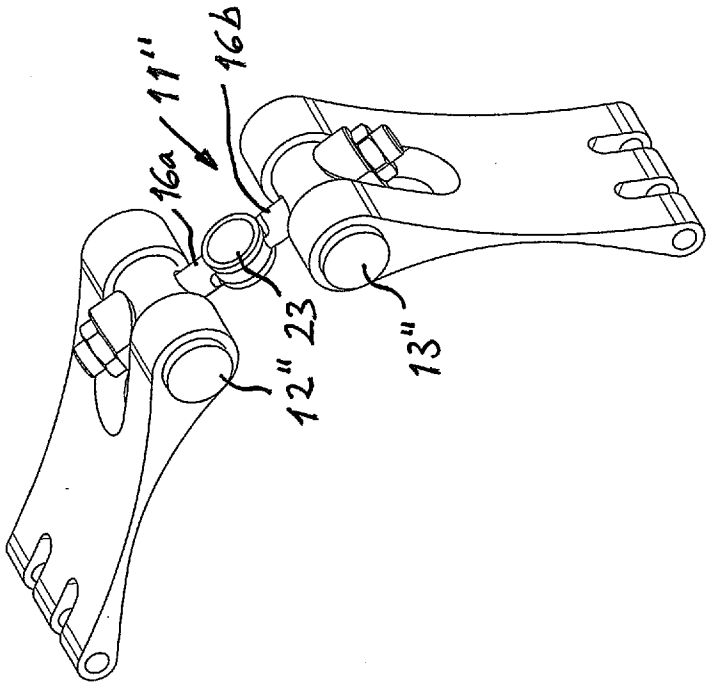

Fig 8

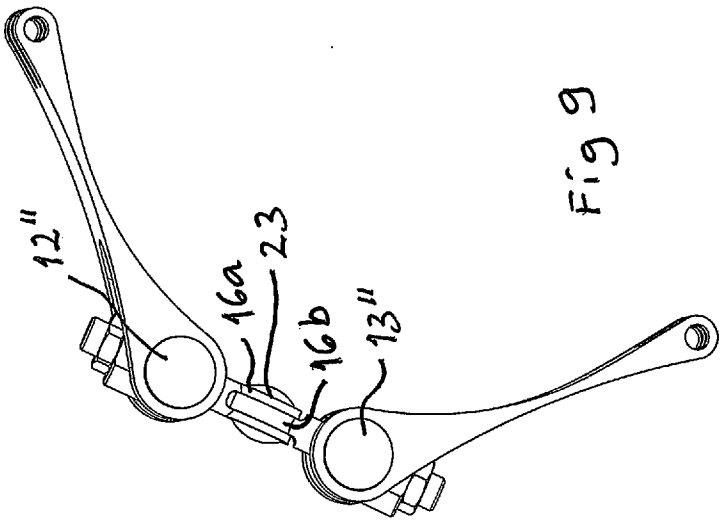

Fig 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2017/050640

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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)

IPC: B60K, F16B

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2941273 A (SKELLY JAMES J), 21 June 1960 (1960-06-21); whole document --	1-13
A	DE 102009042596 A1 (HYDAC ACCESSORIES GMBH), 31 March 2011 (2011-03-31); whole document --	1-13
A	SE 527073 C2 (LEVI PETERSON IND AB), 20 December 2005 (2005-12-20); whole document --	1-13
A	FR 2927132 A1 (CAILLAU ETS), 7 August 2009 (2009-08-07); whole document --	1-13

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25-08-2017	30-08-2017

Name and mailing address of the ISA/SE	Authorized officer
Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Göran Carlström Telephone No. + 46 8 782 28 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2017/050640

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 102012023160 A1 (DAIMLER AG), 1 August 2013 (2013-08-01); whole document -- --------	1-13

International application No.
PCT/SE2017/050640

Continuation of: second sheet

International Patent Classification (IPC)

B60K 15/067 (2006.01)
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US	2941273	A	21/06/1960	NONE			
DE	102009042596	A1	31/03/2011	NONE			
SE	527073	C2	20/12/2005	SE	0500801	L	20/12/2005
FR	2927132	A1	07/08/2009	NONE			
DE	102012023160	A1	01/08/2013	NONE			