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(54) Title: ANTITHEFT DEVICE AGAINST FRAUDULENT ROTATION OF A CONTROL PIN WITH HOLLOW HEAD

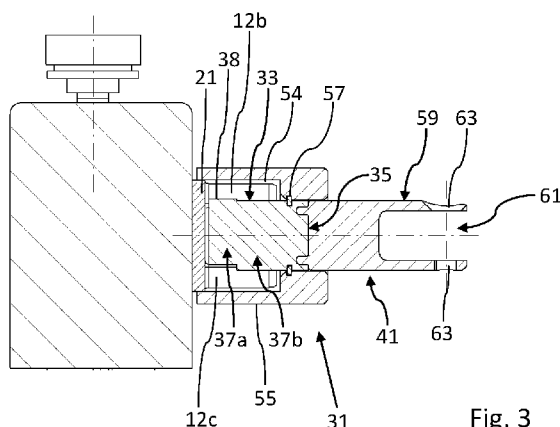


Fig. 3

(57) Abstract: Antitheft device (31) against fraudulent rotation of a control pin (21) with hollow head in which an axial seat (12) is defined having a non-circular cross-section, said seat (12) being adapted to receive an end of a driving member by which said control pin (21) is brought into rotation, said device comprising a cylindrical body (33) in which there are defined, at opposite ends, a control portion (35) and an engaging portion (37), the control portion (35) being provided with engaging means (39) for a control key (41) for controlling rotation of the device and the engaging portion (37) being provided with at least one radial projection (38;40a,40b), so that rotation of the cylindrical body (33) determines rotation of the control pin (21) when the engaging portion (37) is housed in the axial seat (12) and said engaging portion (37) interferes with the inner surface (12a) of said axial seat (12).



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*Antitheft device against fraudulent rotation of a control pin with hollow head**Technical Field*

The present invention relates to a mechanical antitheft device against fraudulent rotation of a control pin with hollow head. More particularly, the present invention relates to a mechanical antitheft device adapted to prevent fraudulent rotation of control pin with a hollow head, in a capstan mechanism for retaining a spare wheel of a vehicle.

Prior Art

Within the field of vehicles it is known to use antitheft bolts and nuts in order to prevent fraudulent removal of vehicle parts. A special use of these nuts and bolts regards the fixing of vehicle wheels. According to prior art, in order to prevent theft of the wheels of a vehicle, at least one of the standard nuts or bolts is replaced with a corresponding one of the antitheft type. An example of these antitheft devices in the form of nuts or bolts is described in EP2469106 (A1). As can be appreciated from the description and from the drawings of said prior art reference, these antitheft devices comprise a cylindrical body in which a control portion is defined at a first end and an engaging portion is defined at the opposite end. The control portion includes an annular groove capable of receiving a proprietary key. The device is equipped with a proprietary key provided with an extension having a shape compatible with the groove. The key is also provided with an outer surface having a shape suitable for the engagement of a standard key, for example a tubular box wrench with hexagonal head. The engaging portion includes either a threaded stem, in the case in which the device is made as a bolt, or a threaded seat, in the case in which the device is made as a nut. The cylindrical body is also externally provided with a ferrule which is associated to the cylindrical body in such a way that it cannot be removed with ease, but it is arranged to freely rotate relative to said body. Fraudulent rotation of the cylindrical body is mainly prevented by the absence of surfaces suitable for engagement with tools such as fixed or adjustable pliers and wrenches, and by the fact that the ferrule rotates idly relative to the cylindrical body. Such a device can be rotated only by coupling it with the proprietary key, which is in practice an interface between the device and the traditional key that would normally be used to rotate a standard bolt or nut, i.e. a bolt or nut not of the anti-theft type.

Still with reference to the field of vehicles, capstan mechanisms for retaining a spare wheel are also known. These mechanisms comprise a capstan on which a flexible member such as a cable or a chain is wound. The free end of the flexible member is engaged with the spare wheel rim, for example by means of an anchor or a yoke. The wheel is firmly held against the chassis or the body of the vehicle by turning the capstan for winding the flexible member by means of the control pin. The rotation of the control pin in the opposite direction causes

unwinding of the flexible member and the consequent disengagement of the spare wheel. The control pin of the capstan includes one end configured to receive a tool with which a human can rotate the pin. This tool can be for instance a crank or a rod equipped with a handle. The coupling between the tool and the control pin is generally carried out with simple expedients known within the field of mechanics. For example, control pins with hollow head and, correspondingly, tools having an end with such a shape and size as to interfere with the inner surface of the cavity of the pin head are known. The cavity of the pin head is generally non-circular and can have for instance an oval or cross-like cross-section, possibly provided with radial openings. The corresponding tool has a male end to which a transverse peg adapted to interfere with the inner surface of the cavity of the control pin head and preferably with the radial openings if provided. This type of coupling between the tool and the control pin also preferably defines an articulated connection that facilitates operation of the capstan by the user. Mechanisms of this type are generally incorporated in vehicles of medium and large size and placed under the vehicle, for example in the back under the load floor. The control pin of the capstan therefore remains generally accessible on the outside of the vehicle and can be potentially rotated by anyone with a suitable tool.

Capstan mechanisms for retaining spare wheels of vehicles equipped with anti-theft devices to prevent fraudulent rotation of the capstan are also known. CN 201446935 describes an example of these mechanisms equipped with antitheft devices. The known devices, however, are mainly suitable for incorporation in capstan mechanisms from the outset. However, no anti-theft devices that can be mounted easily as aftermarket accessories on already existing capstan mechanisms or after installation of the mechanism on the vehicle, for example by the end user, are known.

A main object of the invention is therefore to solve the aforementioned problem of how to facilitate installation of the antitheft device on the capstan mechanism.

The known devices are also often ineffective against burglary attempts carried out by expert subjects, endowed with high physical strength or specific tools. Another object of the invention is therefore to provide an antitheft device which is able to resist burglary attempts carried out with expertise and/or with high strength and/or with tools specifically devised for this purpose.

The known devices are also complex to manufacture and expensive. A further object of the invention is therefore to provide an antitheft device of the aforementioned type, which can be industrially produced in large numbers with ease and at low cost.

A not least object of the invention is to provide a protection sleeve that can be easily mounted manually even by an individual who is not expert and has no specific tools.

These and other objects are achieved with the antitheft device as claimed in the appended claims.

5 *Disclosure of the Invention*

The antitheft device according to the invention can be effectively used for preventing fraudulent rotation of control pin with a hollow head, in a capstan mechanism for retaining a spare wheel of a vehicle. The antitheft device according to the invention comprises a cylindrical body in which there are defined, at opposite ends, a control portion and an engaging
10 portion. The control portion is provided with engaging means for a removable specific control key, by means of which the device is set into rotation. The engaging portion is configured so as to be received in the seat defined by the cavity of the control pin, with an axial insertion movement, and to be able to interfere with the inner surface of said seat when the device is subsequently rotated relative to the control pin.

15 In a first embodiment of the antitheft device, the interference between the engaging portion and the control pin determines reversible engagement of the antitheft device in the control pin when the device is rotated relative to the pin and a torque sufficient to determine engagement is exerted. The antitheft device can be disengaged from the control pin by rotating the device in the opposite direction relative to the control pin, with a torque sufficient to
20 determine disengagement.

Advantageously, thanks to the described configuration, the device remains firmly associated to the control pin and cannot be removed therefrom unless a specific proprietary key is used, capable of engaging in the engaging means of the control portion of the device.

25 In a second embodiment of the antitheft device, the interference between the engaging portion and the control pin preferably does not determine engagement between the two elements and the antitheft device is kept associated to the control pin by means of a supporting bracket. In addition, according to this embodiment, the supporting bracket is preferably fixed to the capstan mechanism by means of antitheft bolts or nuts.

30 The supporting bracket preferably comprises a hole in which the cylindrical body of the device is inserted. The supporting bracket is further preferably retained on the cylindrical body of the device between an elastic ring and an idly rotatable ferrule.

Advantageously, thanks to this second described configuration, the device remains associated to the control pin by virtue of the supporting bracket and cannot be removed from said pin unless the supporting bracket is removed.

The engaging means preferably comprise a groove extending annularly on the base of the control portion of the cylindrical body of the device. The groove extends axially in the body of the device so as to define a corresponding annular seat for a projection provided on the control key. According to the invention, the groove preferably extends continuously. Alternatively, the groove may comprise interruptions. The engaging means may also have seats, for example in the form of holes, variously distributed on the base of the engaging portion. The engaging means are also preferably configured differently for each device or for each batch of devices, so as to make it impossible or very unlikely that the same control key can be coupled with more than one antitheft device.

According to the invention, the cylindrical body of the device is surrounded by a rotatable ferrule. The ferrule is associated to the cylindrical body so as to be substantially unmovable, but so as to be free to rotate idly with respect to the cylindrical body. The purpose of the ferrule is to prevent that the cylindrical body can be rotated without using the specific key. The ferrule therefore extends axially over at least that part of the length of the cylindrical body that is exposed on the outside when the device is associated to the control pin of a capstan mechanism. Therefore, depending on the embodiments of the device, the idly rotatable ferrule extends over the whole length of the cylindrical body or only over part thereof. In addition, preferably, an annular seat, arranged to house the wall of the control pin when the engaging portion of the device is received in the seat of the control pin, is defined between the rotatable ferrule and the engaging portion.

According to the invention, the body of the device and the ferrule are preferably made of high-strength steel.

Brief Description of the Drawings

Some preferred embodiments of the invention given by way of non-limiting examples will be described with reference to the annexed figures, in which:

- Fig. 1 is a front view of the device in a first embodiment of the invention, associated to a capstan mechanism;
- Fig. 2 shows a side view of the device of Fig.1;
- Fig. 3 shows a section of the device of Fig.1 taken along the plane A-A;
- Fig. 4 shows a section of the device of Fig.1 taken along the plane B-B;
- Fig. 5 shows a front view of the device in a second embodiment of the invention, associated to a capstan mechanism;
- Fig. 6 shows a longitudinal section of the device of Fig. 5 corresponding to the one of Fig. 3;

- Fig. 7 shows a longitudinal section of the device of Fig. 5 during assembly, from which the supporting bracket has been omitted;
- Fig. 8 shows an overall view of a capstan mechanism for spare wheels of vehicles.

In all the Figures, the same reference numerals have been used for denoting same or functionally equivalent parts.

Description of Some Preferred Embodiments of the Invention

Reference will initially be made to Fig. 8 in order to describe a generic capstan mechanism known per se for vehicle spare wheels. The mechanism has been generally indicated by the reference 11. It mainly comprises a capstan 13, a flexible member 15 and a yoke or anchor 17. The capstan 13 is housed in a casing 19 and is provided with a control pin 21. The control pin 21 protrudes from the casing 19 for being rotated by means of an appropriate tool that is usually part of the vehicle equipment. In the illustrated embodiment, the flexible member 15 comprises a cable 23. In other embodiments of the mechanism 11, the flexible member 15 may comprise a chain. The flexible member 15 is generally made of high-strength steel. The yoke 17 is firmly attached to the free end of the cable 23 and can be engaged in the rim 25 of the spare wheel 27. The capstan 13 allows to wind and unwind the cable 23 on a spool contained in the casing 19. When the cable 23 is wound by the capstan 13, the spare wheel 27 is brought against the base of a housing provided in the chassis or body of the vehicle. A guide duct 29, open to the base of said housing, is often provided in order to guide the cable 23 along the desired path. In this arrangement, the spare wheel 27 can be separated from the vehicle by acting on the capstan 13 for unwinding the cable 23. Therefore, those who may want to take possession of the spare wheel 27 in a fraudulent way, could try to rotate said control pin 21 of the capstan 13 to unwind the cable 23. This fraudulent operation is made possible by the fact that the pin 21 generally has a shape adapted to be engaged by a standard tool, such as a fixed wrench commonly available on the market. In order to prevent the pin 21 from being rotated, there is provided the antitheft device according to the invention.

The antitheft device according to the invention can be effectively used for preventing fraudulent rotation of a control pin with a hollow head, in a capstan mechanism for retaining a spare wheel of a vehicle.

With reference to the Figs. 1 to 3, a first embodiment of the antitheft device according to the invention will be described, indicated as a whole with the reference numeral 31. In the Figures, the device 31 is associated to a capstan mechanism 11 provided with a flexible member 15 comprising a chain 23a. In this first embodiment, the device 31 according to the invention comprises a cylindrical body 33, in which there are defined, at opposite ends, a control portion 35 and an engaging portion 37. The control portion 35 is provided with

engaging means 39 for a control key 41 by means of which the device 31 is set into rotation. In the illustrated embodiment, the engaging means 39 comprise a groove 43 extending annularly in a continuous manner on the base 45 of the portion 35. The groove 43 extends axially in the body 33 so as to define a corresponding annular seat for a projection 47 provided on the key 41.

The engaging portion 37 is configured so as to be received in the seat 12 defined by the cavity of the control pin 21, with an axial insertion movement, and to be able to interfere with the inner surface 12a of said seat 12 when the device 31 is rotated relative to the control pin 21. In the illustrated embodiment, the seat 12 comprises a pair of radial openings 12c, 12d allowing the radial projection 38 to penetrate into the seat 12. Subsequently, a rotation movement of the body 33 within the seat 12 determines engagement of the device 31 in the control pin 21.

According to this first embodiment of the antitheft device 31, the interference between the engaging portion 37 and the inner surface 12a of the control pin 21 determines reversible engagement of the antitheft device 31 in the control pin 21 when the device 31 is rotated, preferably by a quarter of turn, relative to the pin 21 and a torque sufficient to determine engagement is exerted. The antitheft device 31 can be disengaged from the control pin 21 by rotating, preferably by a quarter of turn, the device 31 in the opposite direction relative to the control pin 21, with a torque sufficient to determine disengagement. Still according to this first embodiment of the invention, the engaging portion 37 comprises a pair of cylindrical portions 37a, 37b, preferably with circular or oval cross-section, said portions having parallel non-coincident axes, so that a first one 37a of said two portions defines at least one radial projection 38 for said second portion 37b. Preferably, the first portion 37a is defined at the end of said cylindrical body 33 and the second portion 37b is defined between said first portion 37a and the control portion 35 of the cylindrical body 33.

A rotatable ferrule 55 is mounted on the body 33. The ferrule 55 is associated to the body 33 by means of a half-ring 57, arranged between the ferrule 55 and the body 33, so as to be freely rotatable. When the device 31 is associated to the control pin 21 of a capstan mechanism 11 for vehicle spare wheels, the ferrule 55 surrounds the portion of the body 33 which remains freely accessible on the outside and, consequently, prevents the possibility for the body 33 to be grasped and rotated fraudulently by a conventional tool.

An annular seat 54 arranged to house the wall of the control pin 21 is defined between the rotatable ferrule 55 and the engaging portion 37.

The key 41 is advantageously provided with a control portion 59 which substantially reproduces the shape of the control pin 21. In the illustrated embodiment, therefore, the portion 59 has an axial seat 61 provided with diametrically opposite radial openings 61a, 61b for

receiving a radial engaging pin of a control rod (not illustrated) which is part of the vehicle equipment. A radial hole 63 can be provided through the portion 59 for securing the rod by means of a cotter pin or other suitable means such as a spring-opposed ball.

Referring to Figs. 5 and 6, there is illustrated a second embodiment of the antitheft device 31. According to this embodiment, the interference between the engaging portion 37 and the control pin 21 preferably does not determine engagement between the two elements and the antitheft device 31 is kept associated to the control pin 21 by means of a supporting bracket 71. In addition, according to this embodiment, the supporting bracket 71 is preferably fixed to the casing 19 of the capstan mechanism 13 or to the chassis of the vehicle by means of antitheft bolts or nuts 73 of a type known per se which is rotatable by means of a removable specific key 75.

The supporting bracket 71 can be flat or L-shaped as in the illustrated embodiment, or it can have a shape suitable for the purpose, depending on the applications. The bracket 71 preferably comprises a hole 77 in which the cylindrical body 33 of the device 31 is received. The supporting bracket 71 is further preferably retained on the cylindrical body 33 of the device 31 between an elastic ring 79 and the idly rotatable ferrule 55.

The engaging portion 37 comprises a radial peg or pin 40 defining at least one radial projection 40a, 40b for the engaging portion 37. The radial pin 40 interferes with the inner surface 12a of the seat 12 at the radial openings 12b, 12c.

Referring in particular to Fig. 7, there is illustrated the device 31 during assembly onto the bracket 71. In Fig. 7 the bracket 71 has been removed for the sake of clarity. As can be appreciated, the ferrule 55 is fitted onto the cylindrical body 33 and firmly secured, though being allowed to rotate freely, by means of the elastic half-ring 57 received in an annular seat formed partially in the body 33 and partially in the ferrule 55.

The device as described and illustrated is susceptible to several variations and modifications, all of them falling within the same inventive principle.

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CLAIMS

1. Antitheft device (31) against fraudulent rotation of a control pin (21) with hollow head in which an axial seat (12) is defined having a non-circular cross-section, said seat (12) being adapted to receive an end of a driving member by which said control pin (21) is set into rotation, said device comprising a cylindrical body (33) in which there are defined, at opposite ends, a control portion (35) and an engaging portion (37), the control portion (35) being provided with engaging means (39) for a control key (41) for controlling rotation of the device and the engaging portion (37) being provided with at least one radial projection (38;40a,40b), so that rotation of the cylindrical body (33) determines rotation of the control pin (21) when the engaging portion (37) is housed in the axial seat (12) and said engaging portion (37) interferes with the inner surface (12a) of said axial seat (12).
2. Device according to claim 1, wherein the engaging portion (37) comprises a radial pin (40) defining said at least one radial projection (38;40a,40b).
3. Device according to claim 2, wherein the engaging portion (37) comprises a radial pin (40) defining diametrically opposite radial projections (38;40a,40b) of said engaging portion (37).
4. Device according to claim 1, wherein the engaging portion (37) comprises a pair of cylindrical portions (37a,37b) having parallel non-coincident axes, so that a first one (37a) of said two portions (37a,37b) defines said at least one radial projection (38;40a,40b) for said second portion (37b).
5. Device according to claim 4, wherein the first cylindrical portion (37a) is defined at the end of said cylindrical body (33) and the second cylindrical portion is defined between said first cylindrical portion (37a) and the engaging portion (35) of the cylindrical body (33).
6. Device according to any one of the preceding claims, wherein there is further provided a ferrule (55) idly rotatable about the cylindrical body (33).
7. Device according to claim 6, wherein the idly rotatable ferrule (55) extends over the whole length of the cylindrical body (33).

8. Device according to claim 6, wherein an annular seat (54) adapted to receive the wall of the control pin (21) is defined between the rotatable ferrule (55) and the engaging portion (37).

9. Device according to any one of the preceding claims, wherein there is provided a supporting bracket (71) attached to said device.

10. Device according to claim 9, wherein the supporting bracket (71) comprises a hole (77) in which the cylindrical body (33) of the device is inserted.

11. Device according to claim 8 or 9, wherein the supporting bracket (71) comprises antitheft securing means (73).

12. Device according to claim 9, wherein the supporting bracket (71) is held on the cylindrical body (33) of the device between an elastic ring (79) and an idly rotatable ferrule (55).

13. Device according to any one of the preceding claims, wherein the engaging means (39) comprise an annular groove (43) formed in the base (45) of the control portion (35).

14. Capstan mechanism for retaining a spare wheel of a vehicle, comprising:

- a capstan (13) provided with a control pin (21),
- a flexible member (15),
- a yoke or anchor (17) firmly fixed to the free end of the flexible member (15) and adapted to be engaged into the rim (25) of a vehicle spare wheel (27), characterized in that it includes an antitheft device (31) made in accordance with any one of claims 1 to 13 and firmly connected to said control pin (21).

15. Use of an antitheft device (31) made in accordance with any one of claims 1 to 13 for preventing fraudulent rotation of a control pin (21) of a capstan mechanism (11) for retaining a spare wheel (27) of a vehicle.

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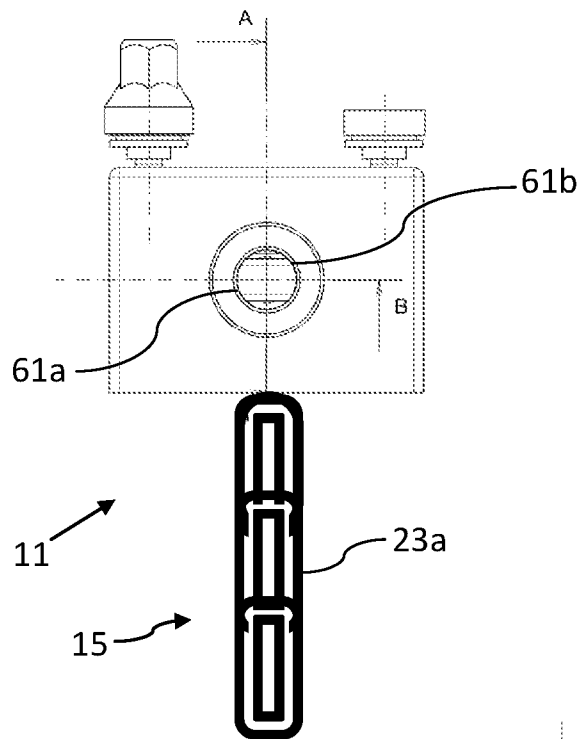


Fig. 1

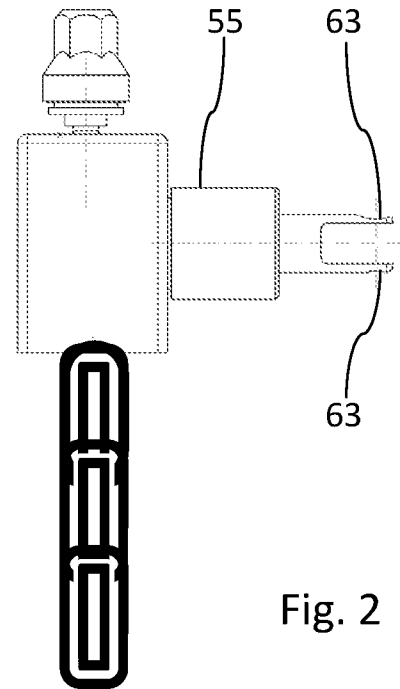


Fig. 2

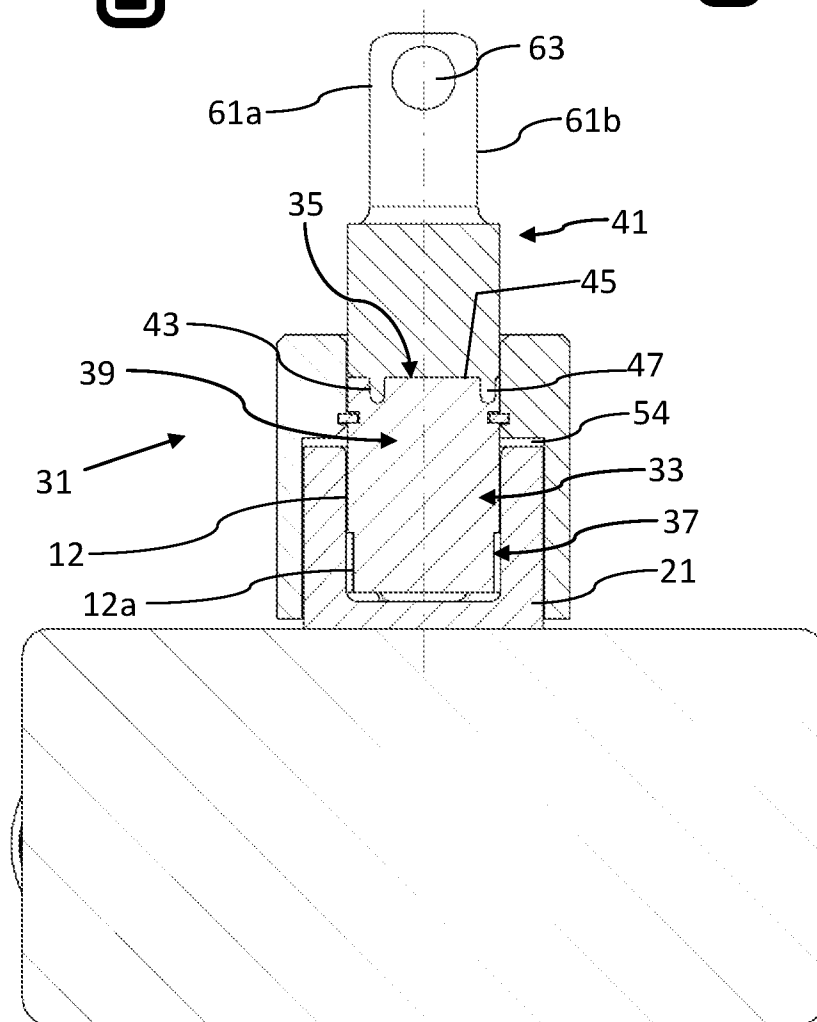
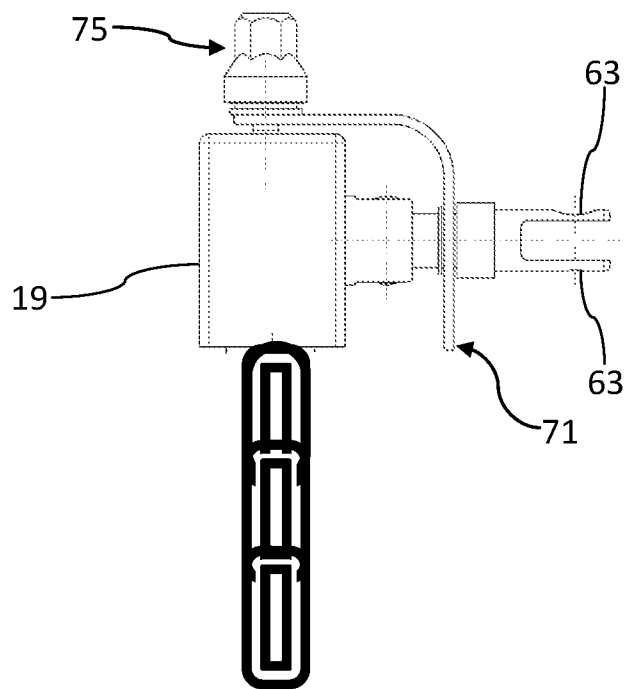
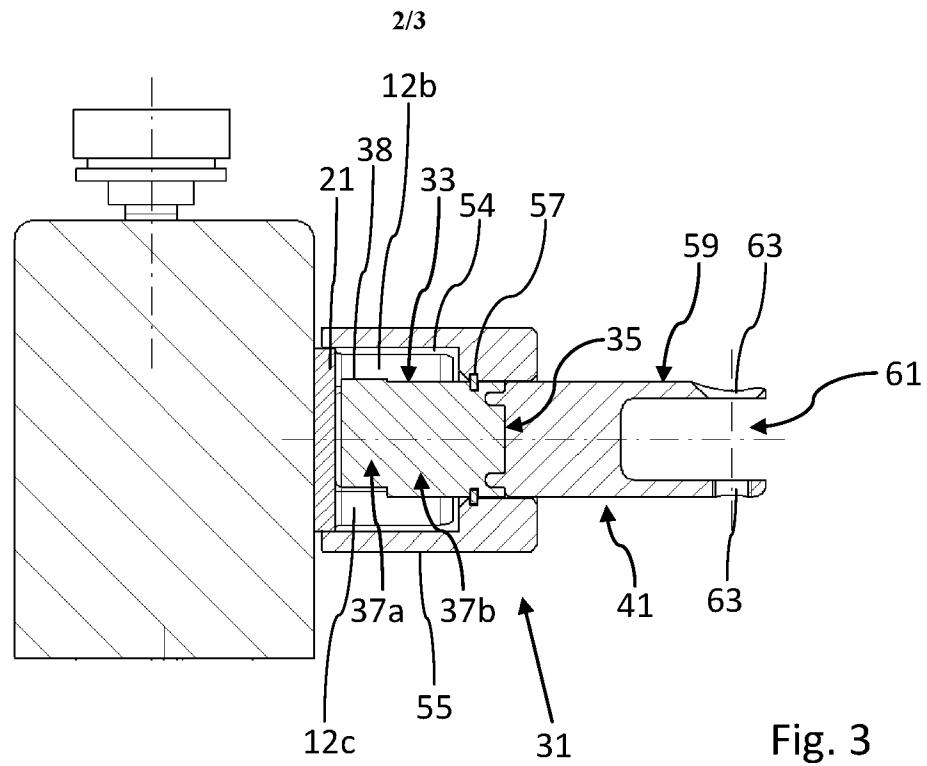
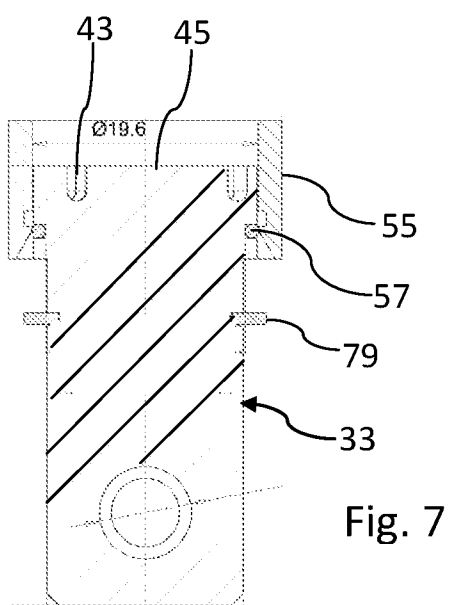
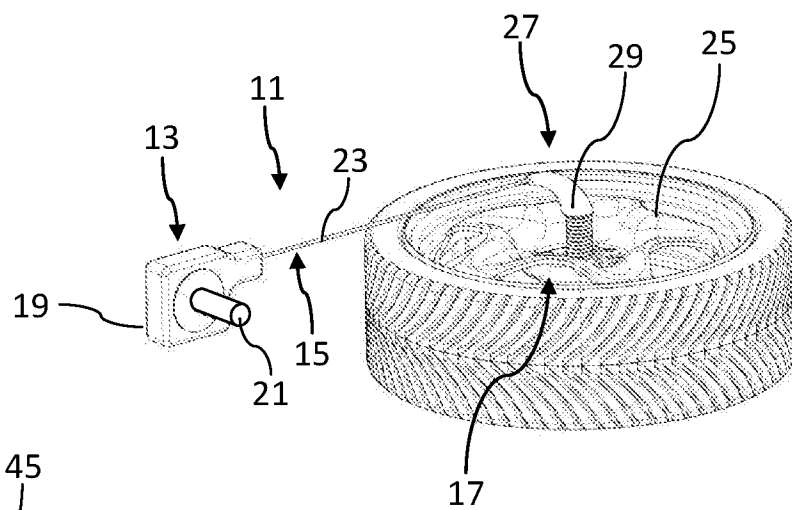
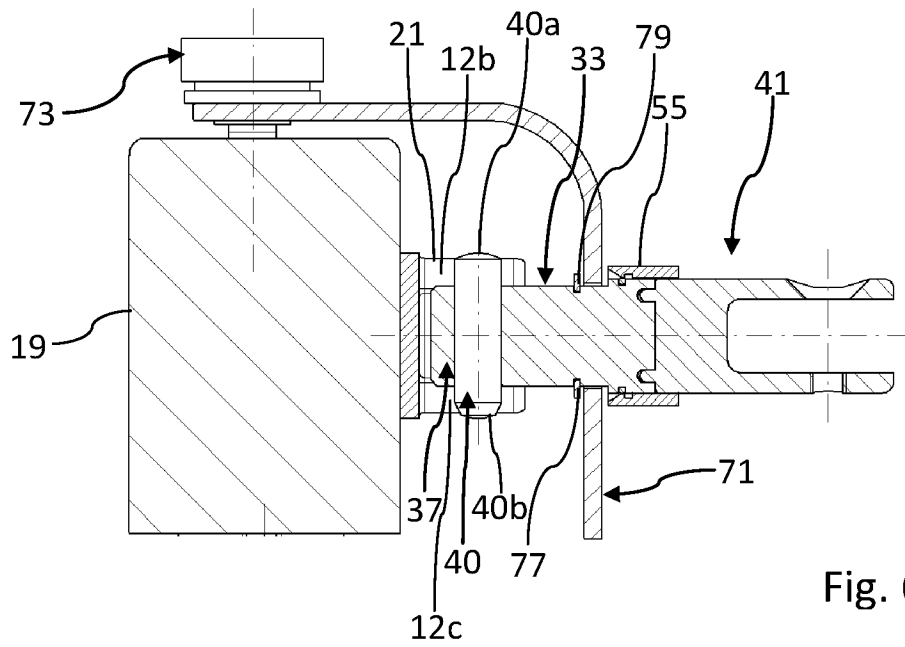


Fig. 4





INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2016/053524

A. CLASSIFICATION OF SUBJECT MATTER

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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 B25B F16B

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)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 6 067 825 A (GALGOVICH PAUL F [US] ET AL) 30 May 2000 (2000-05-30) column 3, line 57 - column 5, line 36; figures 1-20	1-6, 13-15 7-12
A	----- US 4 848 113 A (PARKS JEFFERY R [US]) 18 July 1989 (1989-07-18) column 2, line 51 - column 4, line 12; figures 1-8 -----	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

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Name and mailing address of the ISA/

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Burley, James

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6067825	A	30-05-2000	NONE	

US 4848113	A	18-07-1989	NONE	
