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(73) Patenthaver: **Scharmüller, Josef, Saxigen 14, 4892 Fornach, Østrig**
Scharmüller, Josef, jun., Saxigen 14, 4892 Fornach, Østrig
Scharmüller, Christine, Waldweg 52, 4892 Fornach, Østrig

(72) Opfinder: **Scharmüller, Josef, Saxigen 14, 4892 Fornach, Østrig**
Scharmüller, Josef, jun., Saxigen 14, 4892 Fornach, Østrig
Scharmüller, Christine, Waldweg 52, 4892 Fornach, Østrig

(74) Fuldmægtig i Danmark: **Plougmann Vingtoft A/S, Strandvejen 70, 2900 Hellerup, Danmark**

(54) Benævnelse: **SAMMENKOBLINGSINDRETNING**

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COUPLING DEVICE

The invention relates to a coupling device for a vehicle trailer according to the preamble of claim 1.

A coupling device is an apparatus on the vehicle trailer which is provided for the purpose of releasably and movably coupling the vehicle trailer to the towing vehicle.

In particular for pulling heavy trailers, for example in the field of agriculture, coupling devices are known which have a bearing housing that can be fastened to the vehicle trailer, wherein a shaft having a coupling element is inserted into the bearing housing and is secured on a side opposite the coupling element with a screwed securing element. With this design, the shaft can be exchanged. The shaft is usually rotationally symmetrical about the central axis, wherein a diameter of the shaft decreases with increasing distance from the coupling element, so that the shaft can be inserted into the bearing housing.

The disadvantage of this is that in the event of a fire on the vehicle trailer, access to the coupling device is often prevented or only possible with danger, meaning that the coupling cannot be reliably disconnected. Such a fire can break out, for example, when harvesting dry hay or other highly flammable goods. In this case, the fire can spread from the vehicle trailer to the towing vehicle, whereby the entire vehicle combination is damaged by the fire.

From US 7 669 878 B1 a coupling device for a vehicle trailer is known which has a shaft with a coupling element. The shaft is arranged in a bearing housing and fixed in the bearing housing by means of a cross bolt. The transverse bolt has a compressed spring at one end and a split pin at an opposite end, wherein the split pin can be removed mechanically via a pull rope.

From WO 2009/078817 A1 a coupling device with an emergency unlocking device designed as a lever is known.

From EP 1 418 067 A2 a drawbar eye is known, the shaft of which is rotatably fastened to a flange.

The object of the invention is therefore to provide a coupling device of the type mentioned at the beginning with which the mentioned disadvantages can be avoided, with which the coupling between the vehicle trailer and the towing vehicle can be reliably released even in emergency situations.

According to the present invention this is achieved by the features of claim 1. This has the advantage that the connection between the vehicle trailer and the towing vehicle can be disconnected quickly and reliably even in an emergency, wherein a reliable separation does not require any operating personnel in the region of the coupling itself. With the emergency unlocking device, the connection between the bearing housing and the shaft can be released in an emergency, whereby the shaft, which is still coupled to the towing vehicle by the coupling element, can be pulled out of the bearing housing, and in this way the towing vehicle can move away from the vehicle trailer. The fact that the emergency unlocking device separates the connection between the shaft and the bearing housing in a manner which can be predetermined results in the advantage that the emergency unlocking device can be made more compact than if the connection were separated in the region of the coupling element. Furthermore, the emergency unlocking device does not restrict the maximum pivot angle between the vehicle trailer and the towing vehicle. In addition, different coupling elements can be used without having to convert the emergency unlocking device.

The dependent claims relate to further advantageous embodiments of the invention.

Express reference is hereby made to the wording of the claims, whereby the claims are inserted into the description at this point by reference and are considered to be reproduced verbatim.

The invention is described in more detail with reference to the accompanying drawings, in which only preferred embodiments are shown by way of example. In the figures:

Fig. 1 shows a first preferred embodiment of the coupling device as an axonometric illustration;

Fig. 2 shows the first preferred embodiment of the coupling device as an exploded view;

Fig. 3 shows the first preferred embodiment of the coupling device in a side view;

Fig. 4 shows the section along the line AA in Fig. 3;

Fig. 5 shows a second preferred embodiment of the coupling device as an axonometric illustration;

Fig. 6 shows the second preferred embodiment of the coupling device as an exploded view;

Fig. 7 shows the second preferred embodiment of the coupling device in a side view; and

Fig. 8 shows the section along the line AA in Fig. 7.

Figs. 1 to 8 show preferred embodiments of a coupling device 1 for a vehicle trailer, wherein a straight shaft 3 having a coupling element 2 is arranged in a bearing housing 4, wherein the bearing housing 4 is provided for connection to a drawbar and the coupling element 2 is provided for coupling to a mating coupling element of a towing vehicle. A coupling device 1 is an apparatus which is provided to connect a vehicle trailer to a towing vehicle in a manner which is predeterminedly releasable and pivotable with a towing vehicle. For this purpose, the coupling device 1 has a coupling element 2, which is provided to be coupled to a mating coupling element of the towing vehicle in order to couple the vehicle trailer to the towing vehicle.

The coupling element 2 can in particular be a ring eyelet or a receiving socket.

A preferred embodiment with a receiving socket as the coupling element 2 is shown by way of example in Figs. 1 to 4. In the case of a receiving socket, the mating coupling element is designed as a coupling ball.

A preferred embodiment with a ring eyelet as the coupling element 2 is shown by way of example in Figs. 5 to 8. In the case of the ring eyelet, the mating coupling element is designed as a coupling bolt.

In the operating position, the shaft 3 is partly arranged in the bearing housing 4, wherein the bearing housing 4 is preferably designed such that the bearing housing 4 can be fastened to a drawbar of a vehicle trailer. Here, the bearing housing 4 can have a particularly flat fastening surface which, when the coupling device 1 is fastened, makes contact with a drawbar of the vehicle trailer. Furthermore, the bearing housing 4 can have bores 16 for receiving screws or other connecting means for fastening to the drawbar. The design of the coupling device 1 comprising a shaft and a bearing housing 4 is particularly suitable for absorbing high tensile loads and support loads, such as occur, for example, in agriculture.

It is provided that the bearing housing 4 has an emergency unlocking device 5, that a locking element 6 of the emergency unlocking device 5 can be moved between a locked position and an unlocked position by means of an actuating device 7, wherein, in the locked position, the shaft 3 is held positively in the bearing housing 4 by the locking element 6 and, in the unlocked position, the shaft 3 can be pulled out of the bearing housing 4. The emergency unlocking device 5 is a device of the coupling device 1, which is provided to release the connection between the shaft 3 and the bearing housing 4 in an emergency in a manner which can be predetermined. This process can in particular be referred to as releasing the emergency unlocking device 5. This is done by means of the locking element 6, which can be moved between the locked position and the unlocked position. In the locked position, the locking element 6 holds the shaft 3 in the bearing housing 4. In the unlocked position, however, the shaft 3 can be pulled out of the bearing housing 4. The movement of the locking element 6 between the locked position and the unlocked position takes place by means of the actuating device 7. The actuating device 7 can in particular be designed to be actuatable from the driver cabin of the towing vehicle.

A vehicle trailer is also provided with such a coupling device 1. The vehicle trailer can in particular have a drawbar to which the coupling device 1 is fastened.

Furthermore, a vehicle combination with such a vehicle trailer and a towing vehicle with a driver cabin is provided, wherein the actuating device 7 can be actuated from the driver cabin. The driver cabin is the place in the towing vehicle where the driver is located while the towing vehicle is being driven. Here, an additional operating element can be arranged in the driver cabin, which can be coupled to the actuating device 7.

This has the advantage that the connection between the vehicle trailer and the towing vehicle can be disconnected quickly and reliably even in an emergency wherein a reliable separation does not require any operating personnel in the region of the coupling itself. With the emergency unlocking device 1, the connection between the bearing housing 4 and the shaft 3 can be released in an emergency, whereby the shaft 3, which is still coupled to the towing vehicle by the coupling element 2, can be pulled out of the bearing housing 4, and in this way the towing vehicle can move away from the vehicle trailer. The fact that the emergency unlocking device 1 separates the connection between the shaft 3 and the bearing housing 4 in a manner which can be predetermined results in the advantage that the emergency unlocking device 1 can be made more compact than if the connection were separated in the region of the coupling element 2. Furthermore, the emergency unlocking device 1 does not restrict the maximum pivot angle between the vehicle trailer and the towing vehicle. Furthermore, different coupling elements 2 can be used without converting the emergency unlocking device 1.

The shaft 3 can in particular have an essentially rotationally symmetrical part which can be arranged in the bearing housing 4.

According to the invention it is provided that the locking element 6 is designed as a movable bolt, in particular essentially perpendicular to a central axis of the shaft 3, that the shaft 3 has a receptacle 8 for the bolt, and that the bolt is arranged in the receptacle 8 in the locked position and is arranged outside the receptacle 8 in the unlocked position.

As a result, the emergency unlocking device 1 can be designed in a particularly simple manner.

Furthermore, it can be provided that the bearing housing 4 has a passage 9 for the locking element 6. By inserting the locking element 6 through the passage 9, a form-fitting connection can easily be achieved. In the locked position, the passage 9 can in particular be arranged in alignment with the receptacle 8.

It can preferably be provided that the actuating device 7 is fastened, preferably releasably, to the bearing housing 4. In particular, the bearing housing 4 can have connecting means receptacles 17 arranged around the passage 9. In particular, screws can be provided as connecting means 14 for fastening the actuating device 7 to the bearing housing 4, wherein the connecting means receptacles 17 are designed as threaded bores.

Furthermore, it can be provided that the emergency unlocking device 5 has a spring 10 which presses the locking element 6 in the direction of the locked position. It can thereby be achieved that the locking element 6 is automatically moved into the locked position, whereby in the event of a technical failure of the actuating device 7, for example a loss of the hydraulic fluid, the locking element 6 is not suddenly and unintentionally brought into the unlocked position.

According to the invention it is provided that the receptacle 8 is designed as an elongated, in particular circumferential, groove. The longitudinal extension of the groove can in particular be transverse to the central axis of the shaft 3. The advantage of the elongated groove as a receptacle 8 is that the shaft 3 in the bearing housing 4 can also be rotated about the central axis in the locked position of the locking element 6, so that a tipping vehicle trailer does not also tip over the towing vehicle. An elongated groove as a receptacle 8 can be provided as the coupling element 2, in particular in the case of a ring eyelet. A preferred embodiment with an elongated groove as a receptacle 8 is shown by way of example in Figs. 5 to 8.

The groove can in particular be circumferential, that is to say around the entire circumference of the shaft 3. Alternatively, the groove can run only around part of the

circumference of the shaft 3, and thus restrict the angle of rotation of the shaft 3 around its centre lug.

It can be provided that the groove has a constant depth around the circumference, as is shown by way of example in Fig. 6.

It can most preferably be provided that the elongated groove has a variable depth. Due to the variable depth of the groove, in the case of a locking element 6 with the spring 10, it can be achieved that the locking element 6 exerts a restoring force in the direction of the point of the groove with the deepest depth. The depth of the groove is to be measured perpendicular to the central axis of the shaft 3. The groove can, in particular, have the greatest depth in a first region of the groove, in which the locking element 6 engages when the coupling element 2 is in a horizontal position. As a result, the coupling element 2 can be held horizontally by the locking element 6, wherein furthermore a rotation of the coupling element 2 about the central axis of the shaft 3 is ensured in case of tilting.

Alternatively, it can be provided that the receptacle 8 is designed as a hole, in particular a blind hole. The formation as a hole can be provided as the coupling element 2 in particular in the case of a receiving socket, since here the coupling element 2 itself already offers protection against the towing vehicle tipping over. A preferred embodiment with a blind hole as a receptacle 8 is shown by way of example in Figs. 1 to 4.

In particular, it can be provided that the shaft 3 is formed in one piece with the receptacle 8. Here, the receptacle 8 is formed directly in the body forming the shaft 3. The advantage of this is the simple design.

Alternatively, it can be provided that the shaft 3 has a base body 11 having the coupling element 2, a receiving body 12 having the receptacle 8, and a securing element 13 for fastening the receiving body 12 releasably to the base body 11. The receiving body 12 can in particular be a ring that can be plugged onto the base body 11, wherein the receiving body 12 most preferably has a circumferential groove on the outside which forms the receptacle 8. The securing element 13 can in particular be designed as a screw nut, wherein the base body 11 most preferably has a thread for receiving the securing element

13 at an end facing away from the coupling element 2. The advantage of this is that the receiving body 12, which is worn out during operation, can easily be replaced. Furthermore, there is the advantage that the shaft 3 can be exchanged for maintenance purposes without actuating the emergency unlocking device 5.

It can most preferably be provided that the actuating device 7 can be actuated hydraulically, and in particular that the locking element 6 can be brought from the locked position into the unlocked position by applying hydraulic pressure. In particular, it can be provided here that the emergency unlocking device 5 has a hydraulic system for actuating the actuating device 7. The hydraulic system can be part of the hydraulics of the vehicle trailer, which can be coupled to the hydraulics of the towing vehicle. The advantage of this is that the force required for the reliable operation of the emergency unlocking device 5 can easily be made available by the hydraulics.

In particular, it can be provided that the actuating device 7 is designed as a hydraulic cylinder, wherein the locking element 6 is designed as a hydraulic piston. It can preferably be provided that the actuating device 7 has a hydraulic connection 15.

Alternatively, the actuating device 7 can be designed electrically.

The actuating device 7 can in particular be connected to a remote control, in particular a cable remote control, in order to release the emergency unlocking device 5.

The remote control can in particular be arranged on the towing vehicle, in particular in the driver cabin. The remote control can in particular have a manually actuatable operating element, in particular a push button or a switch, upon actuation of which the locking element 6 is moved from the locked position into the unlocked position.

Furthermore, it can be provided that the remote control and/or the hydraulic system has further switches connected in series with the operating element, which enable the actuating device 7 to be actuated only when predetermined conditions are met.

The further switch can in particular be a manually actuatable switch, in particular a rotary knob. In this case, before the operating element is actuated, the manually actuatable switch must first be actuated, which reduces the probability of the emergency unlocking device 5 being accidentally released.

The further switches can also comprise switches which close the switching contacts when the speed drops below a limit speed, in particular 15 km/h, and/or when the power take-off drive is switched off. This has the advantage that the emergency unlocking device 5 can be prevented from being released in the event of dangerous boundary conditions.

Furthermore, it can be provided that the hydraulic system of the emergency unlocking device 5 has a manually actuatable control console. The control console can in particular be arranged in an easily accessible manner in the region of the drawbar. The control console can in particular have a hand lever for actuating the actuating device 7. As a result, the emergency unlocking device 5 can be released even if the remote control is defective, or for maintenance purposes.

Patentkrav

1. Sammenkoblingsindretning (1) til en køretøjsanhænger, hvor et lige skaft (3) med et sammenkoblingselement (2) er indrettet i et lejehus (4), hvor lejehuset (4) er tilvejebragt til forbindelse med en trækstang og sammenkoblingselementet (2) er tilvejebragt til sammenkobling med et parringssammenkoblingselement på et trækkøretøj, hvor lejehuset (4) har en nødoplåsningsindretning (5), hvor et låseelement (6) af nødoplåsningsindretningen (5) kan bevæges mellem en låst position og en ulåst position ved hjælp af en aktiveringsindretning (7), hvor skaftet (3) i den låste position er holdt formsluttende i lejehuset (4) via låseelementet (6), og i den ulåste position kan skaftet (3) trækkes ud af lejehuset (4), hvor låseelementet (6) er udformet som en bolt, som især er bevægelig i alt væsentligt vinkelret på en midterakse af skaftet (3), hvor skaftet (3) har en modtager (8) til bolten, hvor bolten er indrettet i modtageren (8) i den låste position og er indrettet uden for modtageren (8) i den ulåste position, **kendetegnet ved, at** modtageren (8) er udformet som en aflang, især periferisk, rille.

2. Sammenkoblingsindretning (1) ifølge krav 1, **kendetegnet ved, at** lejehuset (4) har en gennemføring (9) til låseelementet (6).

3. Sammenkoblingsindretning (1) ifølge krav 1 eller 2, **kendetegnet ved, at** nødoplåsningsindretningen (5) har en fjeder (10), som presser låseelementet (6) i retning af den låste position.

4. Sammenkoblingsindretning (1) ifølge et af kravene 1 til 3, **kendetegnet ved, at** den aflange rille har en variabel dybde.

5. Sammenkoblingsindretning (1) ifølge et af kravene 1 til 4, **kendetegnet ved, at** skaftet (3) er udformet i ét stykke med modtageren (8).

6. Sammenkoblingsindretning (1) ifølge et af kravene 1 til 4, **kendetegnet ved, at** skaftet (3) har et grundlegeme (11) omfattende sammenkoblingselementet (2), et modtagerlegeme (12) omfattende modtageren (8) og et fastgørelses-

element (13) som aftageligt fastgør modtagerlegemet (12) til grundlegemet (11).

7. Sammenkoblingsindretning (1) ifølge et af kravene 1 til 6, **kendetegnet ved, at** aktiveringsindretningen (7) kan aktiveres hydraulisk, og at især låseelementet (6) kan bevæges fra den låste position til ulåste position ved at påføre et hydrauliktryk.

8. Køretøjsanhænger med en sammenkoblingsindretning (1) ifølge et af kravene 1 til 7.

9. Køretøjskombination med en køretøjsanhænger ifølge krav 8 og et trækkøretøj med et førerhus, **kendetegnet ved, at** aktiveringsindretningen (7) kan aktiveres fra førerhuset.

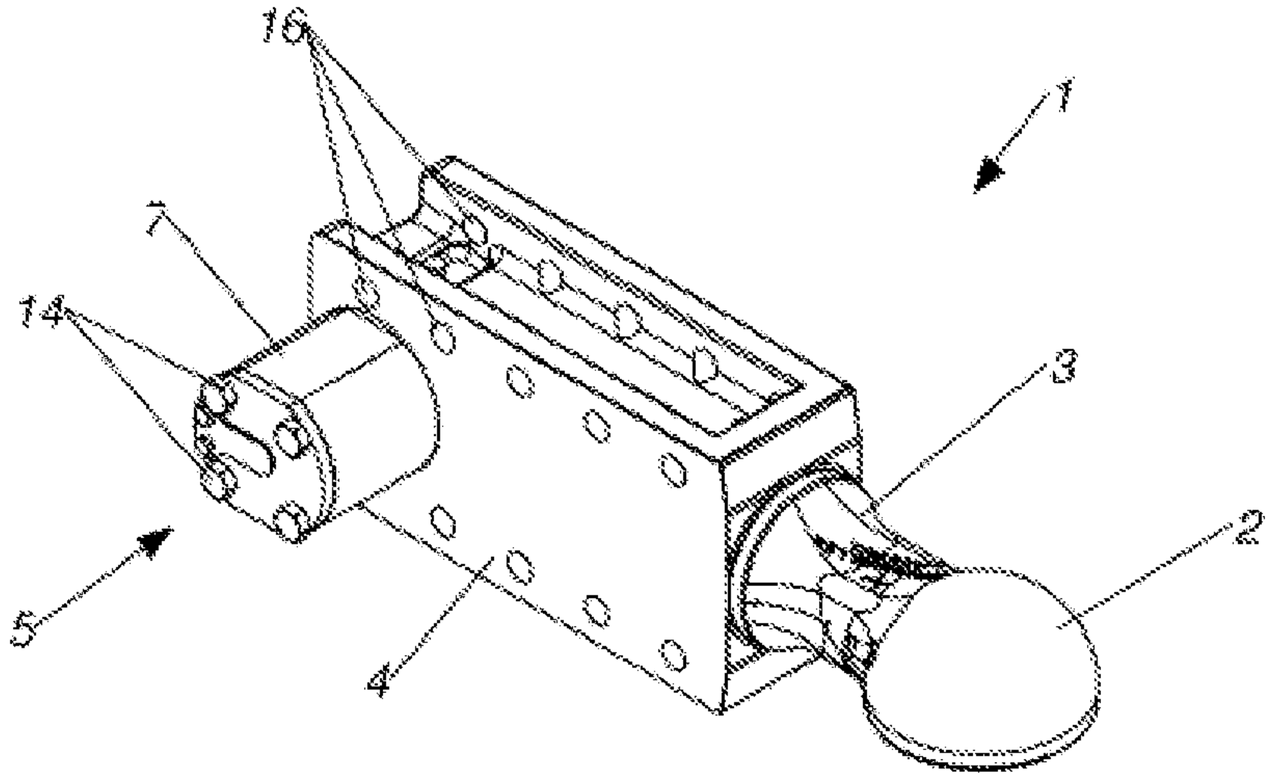


Fig. 1

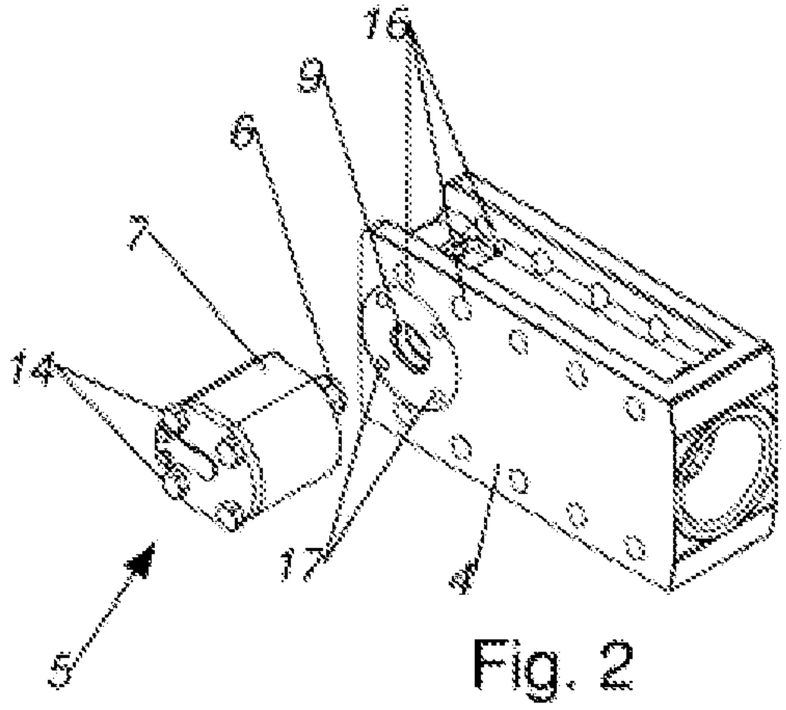
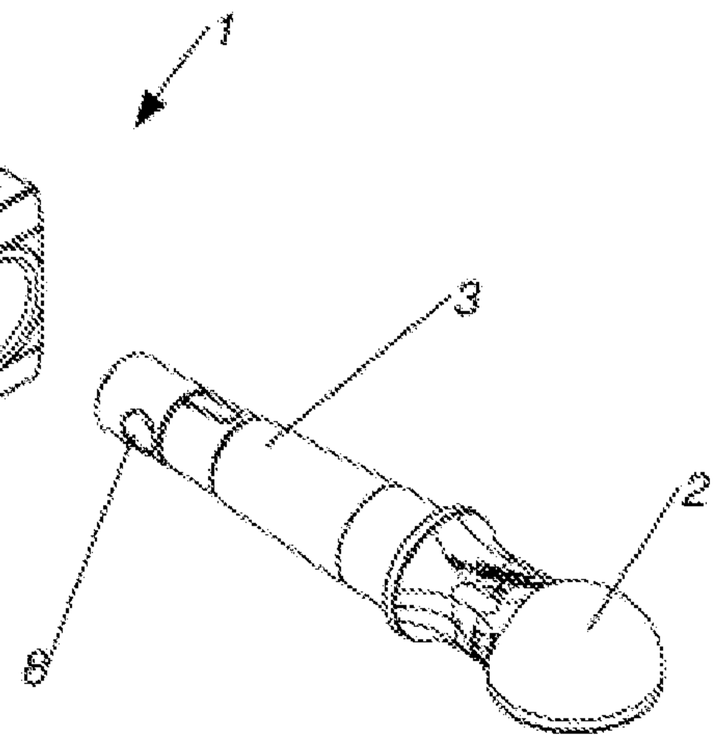


Fig. 2



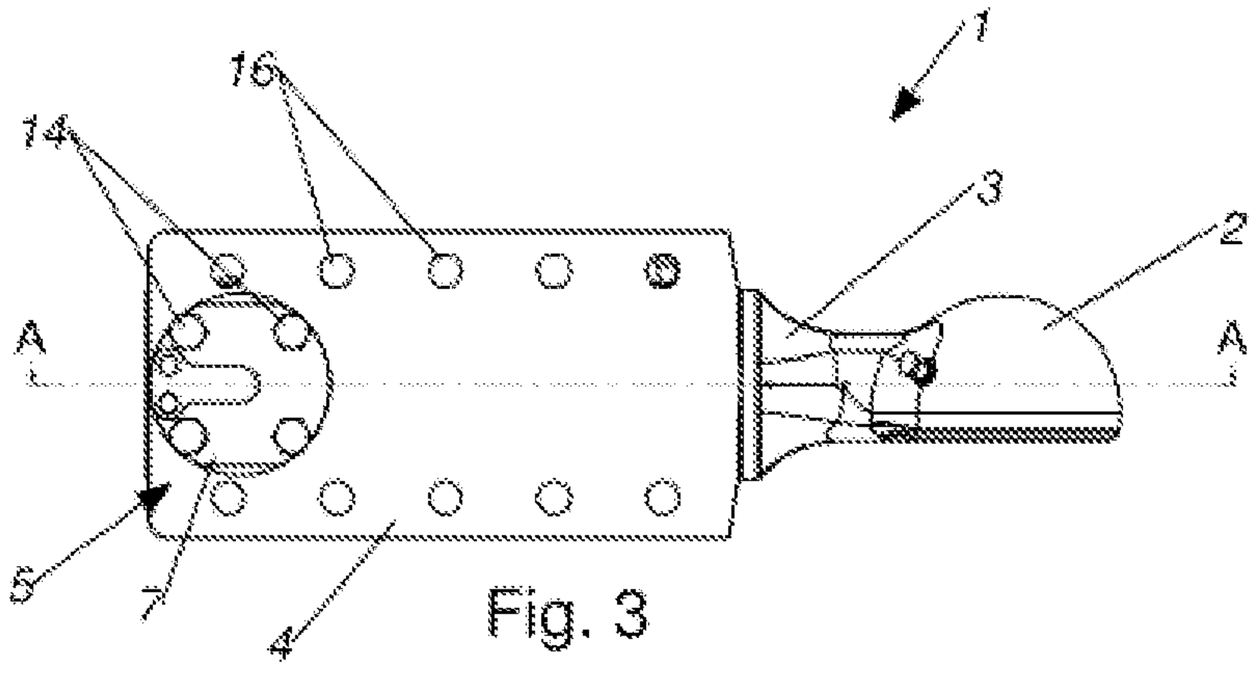


Fig. 3

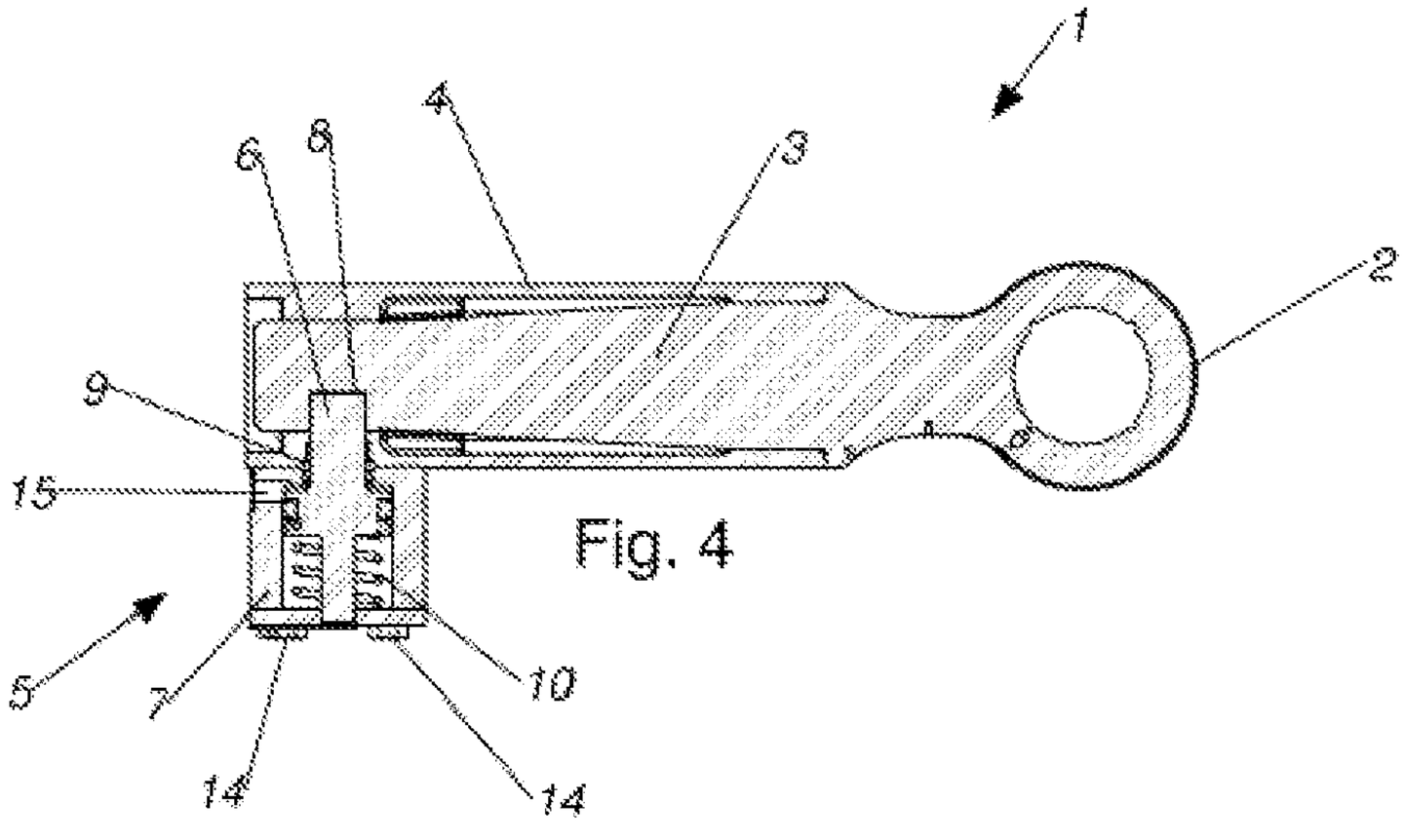


Fig. 4

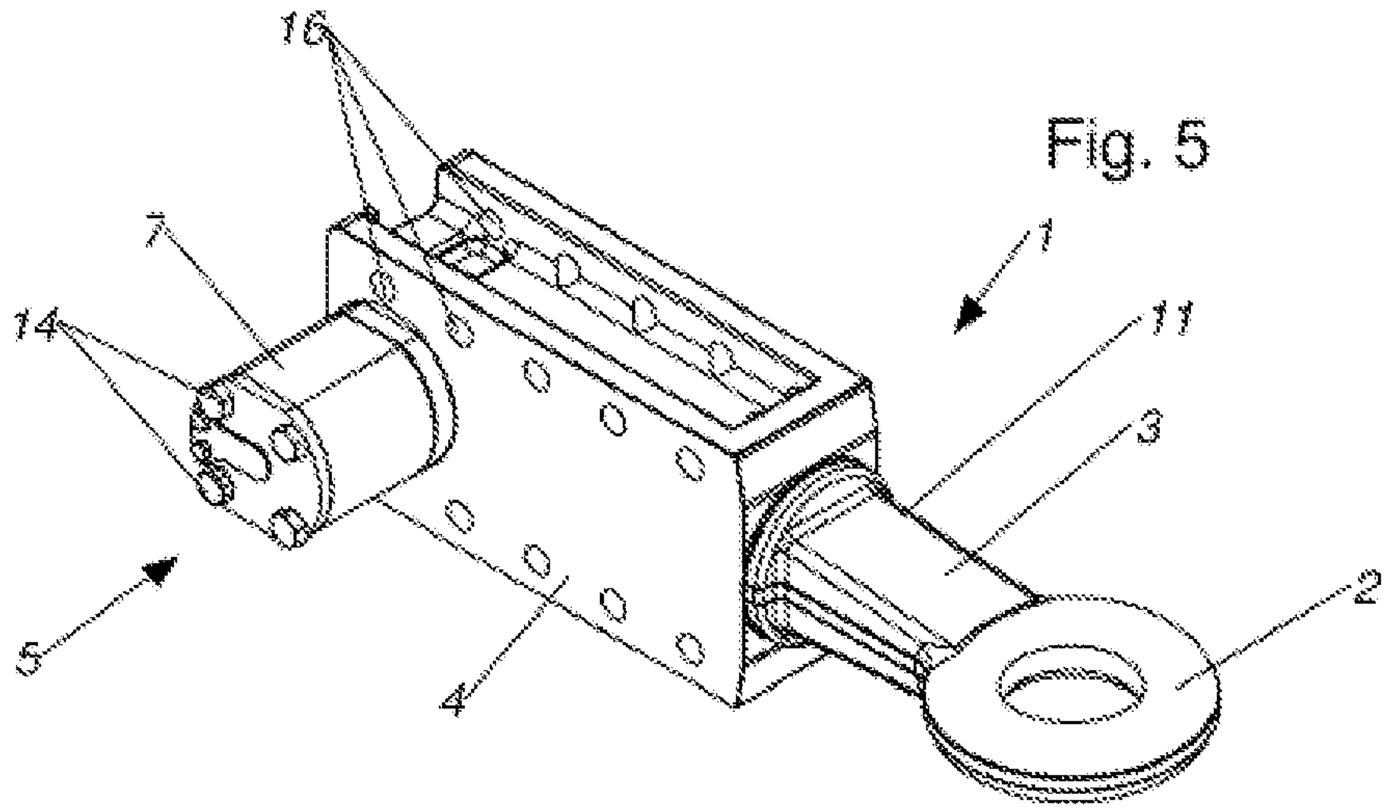


Fig. 5

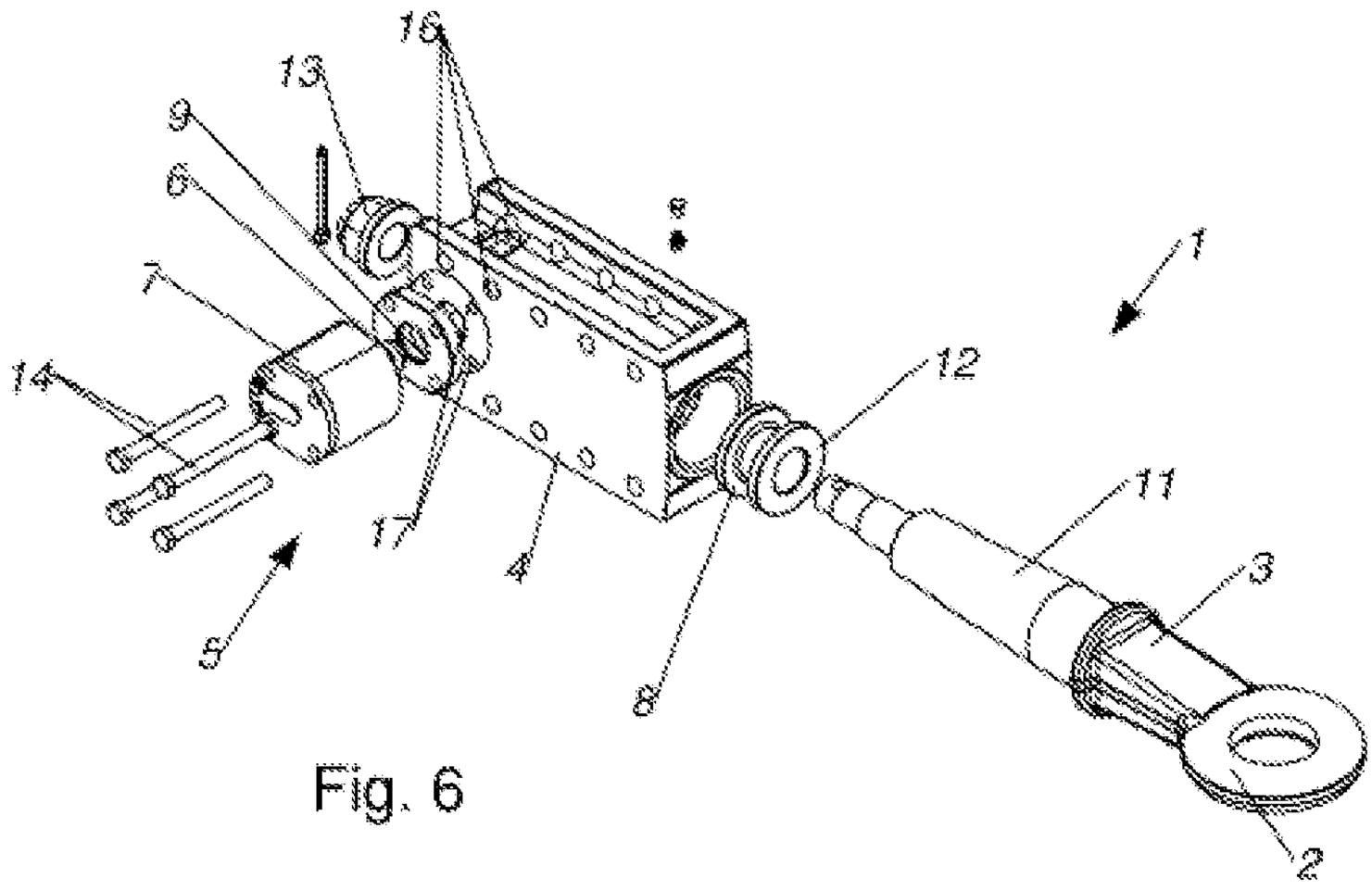


Fig. 6

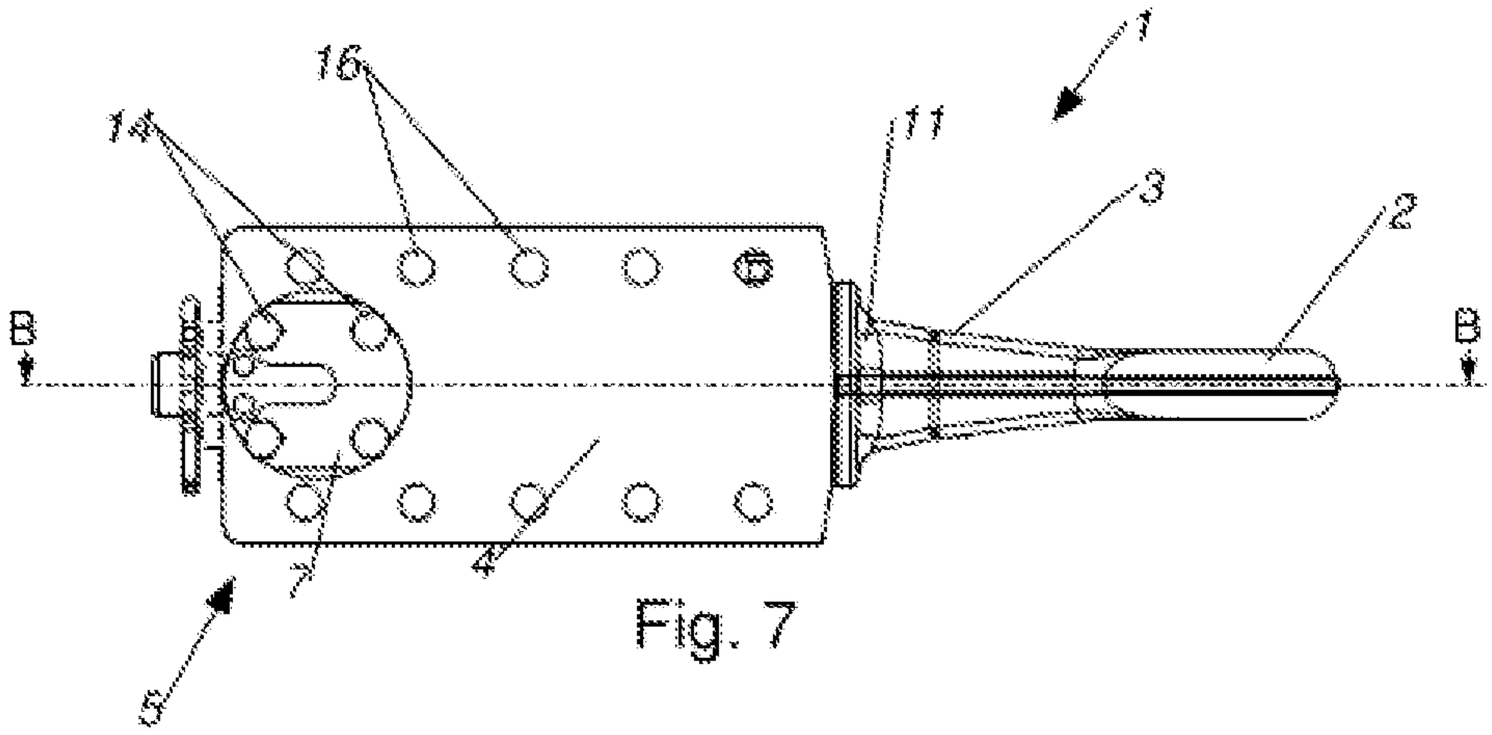


Fig. 7

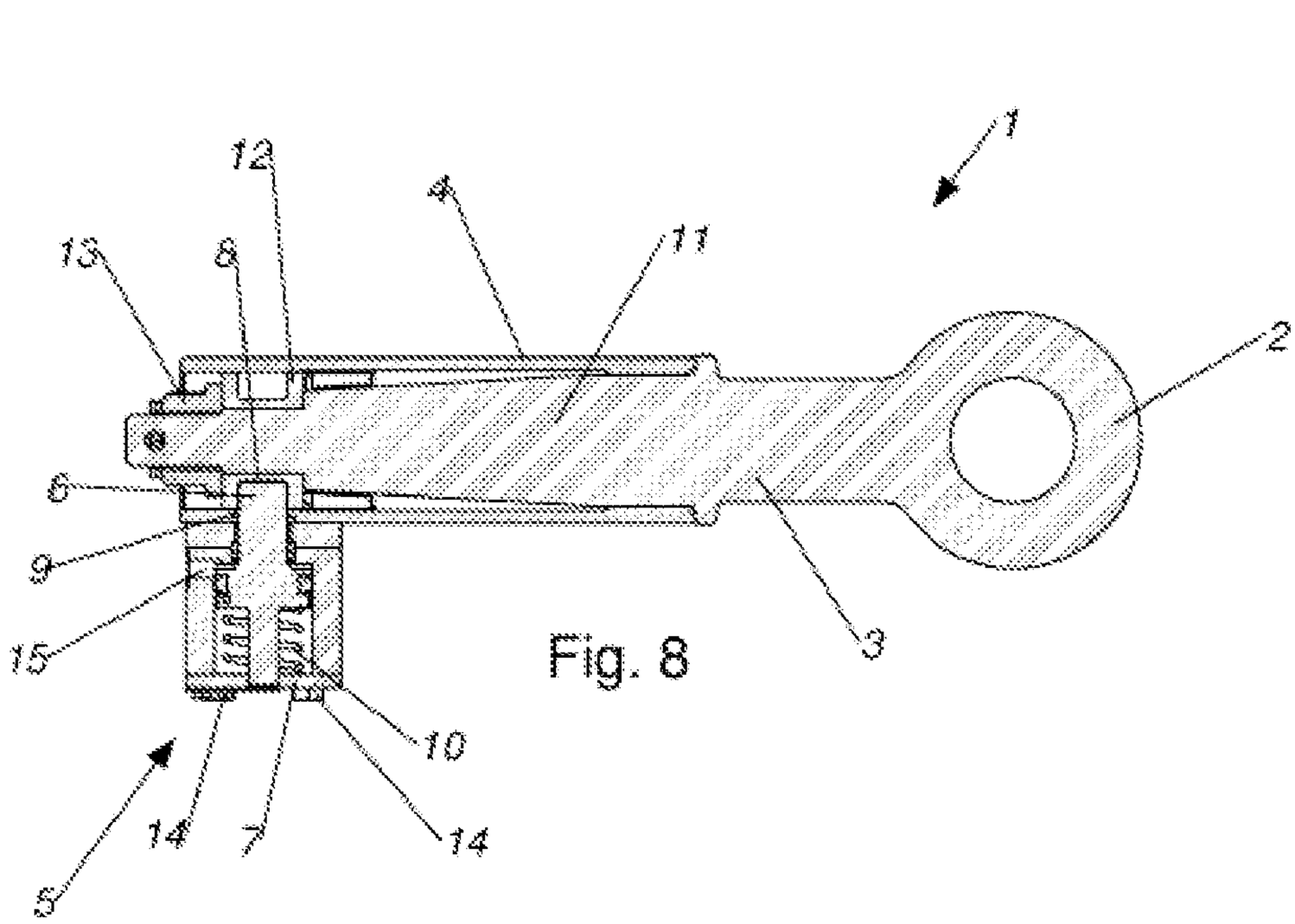


Fig. 8