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(54) ENERGY ABSORBING AND DISSIPATING DEVICE FOR VEHICLE COUPLING

(57) The present invention relates to an energy absorbing and dissipating device for vehicle coupling having a fork (3), wherein the fork (3) has a pin (7) mounted therein for mounting the ear assembly (1) connecting the vehicle coupling head, and on the rear side of the fork (3) a pin is mounted with a set of cushioning inserts (11). The set of inserts (11) on the side of the fork (3) is secured by a stop plate (5), constituting a limiter for movement in the coupling pulling direction, and on the opposite side by a back plate (6) and a locking element (13), and the entire structure is closed by a locking element (10), constituting a limiter for movement in the coupling pushing direction, the device additionally having a housing (4) in which the other components can move slidingly, and in which the locking element is mounted (10). The device is characterized in that the housing (4) is shaped like a sleeve, there is a circumferential fastener (2) on the outside of the housing (4), the fastener (2) having screw holes (2a') for mounting it to the vehicle wall, and cutting knives (15) for cutting the housing surface (4), the fastener (2) is fitted onto the housing (4) and further clamped onto it with a locking ring (14), the housing (4) has slots (15a) for knives (15) on the outer surface, where the fastener (2) is located.

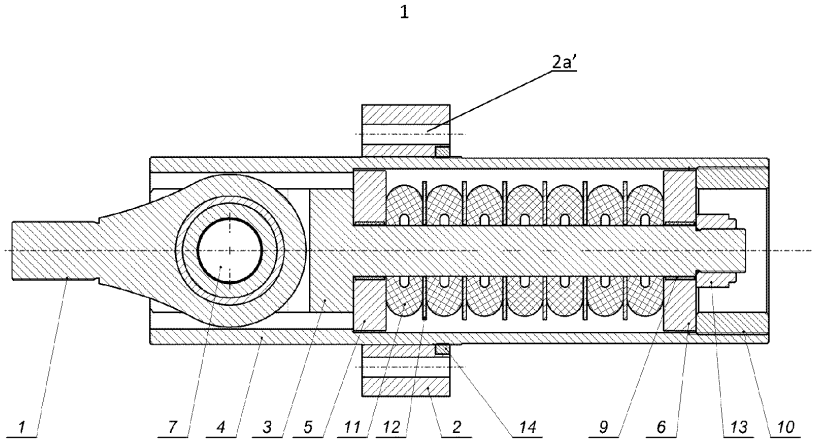

Fig. 1

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Description

[0001] The present invention relates to an energy absorbing and dissipating device for vehicle coupling with a fork, wherein the fork has a pin mounted therein for mounting the lug assembly connecting the vehicle coupling head, and on the rear side of the fork a pin is mounted with a set of shock-absorbing inserts, the set of inserts on the side of the fork being secured by a stop plate, constituting a limiter for movement in the coupling pulling direction, and on the opposite side by a back plate and a locking element, and the entire structure is closed by a locking element, constituting a limiter for movement in the coupling pushing direction, the device additionally having a housing in which the other components can move slidingly, and in which the locking element is mounted.

[0002] Coupling shock absorbers are commonly used to connect vehicles, such as locomotives and railway cars. They are used to absorb vibrations and stresses in the coupling caused by the pull of one vehicle by another, e.g. when a vehicle starts pulling a coupled wagon, and the push of one vehicle by another, e.g. when a vehicle stops and the pulled wagon gets closer, or during the coupling procedure if it is carried out with automatic couplings. Some such devices are additionally equipped with an additional mechanism to dissipate energy in the event of a collision, usually in the form of a deformable component.

[0003] A device of this type is presented in the EP3442847B1 document, equipped with a housing in which the shock absorber components are slidably mounted, the component of which is a pin with a set of shock-absorbing discs, while an additional component for dissipating energy at collision is a deformable (plastic deformation) sleeve.

[0004] The EP2640620B1 document discloses a device equipped with a housing in which the shock absorber components are slidably mounted, while the component for energy dissipation is a rod, the outer surface of which is sheared by shearing blades mounted on its circumference.

[0005] Known solutions are mounted in a special recess in the wall of a vehicle (e.g., locomotive, railway car) in such a way that substantially all of it, except for a protruding hitch for coupling another vehicle, fits within the recess. Such solutions take up quite a lot of space within the car and, in addition, access to their components, such as for servicing purposes, is difficult.

[0006] The present invention solves the above problem.

[0007] The present invention relates to an energy absorbing and dissipating device for vehicle coupling having a fork, wherein the fork has a pin mounted therein for mounting the lug assembly connecting the vehicle coupling head, and on the rear side of the fork a pin is mounted with a set of shock-absorbing inserts. The set of inserts on the side of the fork being secured by a stop plate, constituting a limiter for movement in the coupling pulling direction, and on the opposite side by a back plate and a locking element. The entire structure is closed by a locking element, constituting a limiter for movement in the coupling pushing direction. The device also has a housing in which the other components can move slidingly, and in which the locking element is mounted. The device is characterized in that

the housing is shaped like a sleeve,

there is a circumferential fastener on the outside of the housing, the fastener having screw holes for mounting it to the vehicle wall, and cutting knives for cutting the housing surface,

the fastener is fitted onto the housing and further clamped onto it with a locking ring,

the housing has slots for knives on the outer surface, where the fastener is located.

[0008] Preferably, the set of shock-absorbing inserts consists of elastomeric inserts separated by spacers.

[0009] Preferably, the housing is shaped like a sleeve.

[0010] More preferably, the locking element is a sleeve located inside the housing and threaded to it.

[0011] Also more preferably, the housing in the form of a sleeve has at least one cutout at the rear end running from the edge of the sleeve substantially to the fastener.

[0012] Even more preferably, the locking element is shaped like a sleeve with flattened walls, with the flattened walls corresponding to the cutouts in the housing, and the locking element is connected to the housing with pins and screws.

[0013] Preferably, the locking element is a nut.

[0014] Also preferably, the housing on the outer surface of the front end has a protrusion that serves as a housing stroke limiter. More favorably, the protrusion runs around the entire circumference of the housing.

[0015] Also more preferably, the housing has two cutouts located at the top and bottom of the housing.

[0016] Preferably, the housing and the locking ring are threaded together.

[0017] The present invention is shown in the embodiment images, where fig. 1 and fig. 2 show the embodiment of the invention in longitudinal section from the side and from above, fig. 3 shows a view of the device according to this embodiment from the side of the pin, and a cross-section along the E-E line of a fastener section, fig. 4 shows a perspective view of the device according to the embodiment from fig. 1-2 from the side of the pin, fig. 5 shows an enlargement of detail A from fig. 2, fig. 6 shows a perspective view and cross-section of the fastener, fig. 7 shows a perspective view of the housing, fig. 8 shows a perspective view of another embodiment of the device according to the invention, fig. 9-10 show the same embodiment in longitudinal section from the side and

from above. For clarity, not all components are labeled on all figures.

[0018] As can be observed in the figures, in the embodiment the energy absorbing and dissipating device for vehicle coupling has a fork (3), wherein the fork (3) has a pin (7) mounted therein for mounting the lug assembly (1) connecting the vehicle coupling head. On the rear side of the fork (3) a pin is mounted with a set of cushioning inserts (11). The set of inserts (11) on the side of the fork (3) is secured by a stop plate (5), constituting a limiter for movement in the coupling pulling direction, and on the opposite side by a back plate (6) and a locking element (13). The entire structure is closed by a locking element (10), constituting a limiter for movement in the coupling pushing direction. The device has a housing (4) in which the other components can move slidingly, and in which the locking element is mounted (10).

[0019] The housing (4) is shaped like a sleeve and there is a circumferential fastener (2) on the outside of the housing (4). The fastener (2) in the embodiment has a shape similar to a rectangle with rounded comers, but it can also have a shape similar to a square, oval, round or any other shape known in the field. The fastener, shown best in fig. 6 (2), has screw holes (2a') for mounting to the vehicle wall and cutting knives (15) (not shown in fig. 6 but visible in fig. 3-4 and 8) for cutting the housing surface (4). The fastener (2) is fitted onto the housing (4) and further clamped onto it with a locking ring (14). In a preferrable embodiment (not shown), the housing (4) and the locking ring (14) are threaded together, but they can also be connected by other means known in the field. The fastener (2) in the embodiment is equipped with hooking holes (2a) for the key or other features that allow the key to be hooked (grooves, recesses), which facilitates its mounting in the device, but it is not necessary.

[0020] The housing (4) has slots (15a) for knives (15) on the outer surface, where the fastener (2) is located, which can be best observed in fig. 7. Due to the placement of the knives (15) in the slots (15a) and the use of the locking ring (14), the fastener (2) is firmly pressed with the knives (15) to the housing (4) so that it will not slide along the housing (4) during normal operation of the device.

[0021] In a preferrable embodiment the set of shock-absorbing inserts (11) consists of elastomeric inserts (11) separated by spacers (12), but shock-absorbing elements of other types known in the field can also be used. IN the embodiment shown in the figures the housing (4) is a sleeve and the locking element (10) is a sleeve located inside the housing (4) and threaded to it. In the embodiment, the locking element (13) is a nut, but it can be any other locking element known to the state of the art.

[0022] The embodiment shown in fig. 8-10 differs from the previous one in that the housing (4) in the form of a sleeve has at least one cutout (4a) at the rear end running from the edge of the sleeve (4) substantially to the fastener (2). The locking element (10) is shaped like a sleeve with flattened walls, with the flattened walls corresponding to the cutouts (4a) in the housing (4), and the locking element (10) is connected to the housing (4) with pins (19) and screws (17). In the example shown, the housing (4) has two (4a) cutouts located at the top and bottom of housing (4), but a different number of cutouts (4a) can be used, such as more (reducing the weight of the device) or just one (a compromise between weight and durability). In this embodiment, the housing (4) on the outer surface of the front end has a protrusion (18) that serves as a housing (4) stroke limiter and preferably this protrusion (18) runs around the entire housing (4) circumference (but it is not necessary). The protrusion (18) is used to limit the stroke of housing (4) in the event of vehicle collision.

[0023] The device is mainly used in center couplings (though not limited to them) and is used to absorb energy in the reversible range (shock absorption of ordinary movements between coupled vehicles) and in the collision range (absorbing energy from an uncontrolled collision). The device is mounted to the vehicle with a fastener (2), in such a way that the part on the vehicle side is placed in a compartment within the vehicle and mounted to the vehicle wall with bolts passing through the fastener (2) and the vehicle wall. The center coupling head (not shown) is mounted to the lug assembly (1) in a manner that takes away all degrees of freedom. It can be, for example, a threaded connection.

[0024] A set of shock-absorbing inserts (11) (e.g. elastomeric inserts [11] and spacers [12], as shown in the embodiment) is used to absorb energy in the reversible range. During pushing, force is transmitted from the lug assembly (1) through the pin (7), fork (3), stop plate (5), insert set (11), back plate (6), locking element (10), housing (4) and fastener (2) to the vehicle. During pushing, the set of inserts (11) becomes compressed and absorbs energy. During pulling, force is transmitted from the lug assembly (1) through the pin (7), fork (3), locking element (13), back plate (6), insert set (11), stop plate (5), housing (4) and fastener (2) to the vehicle. During pulling, the set of inserts (11) becomes compressed and absorbs energy.

[0025] A cutting technology is used to absorb energy in the collision range. If the force exceeds the preset value during the push described above, the housing (4) will slide inside the vehicle cavity and the force will be transmitted from the housing (4) to the knives (14) in the fastener (2). During this process, the knives (14) punch grooves in the outer surface of the housing (4), which is associated with energy absorption.

[0026] Of course, the invention is not limited to the embodiments described above, and the features indicated in the claims may be combined with each other in any combinations appropriate for a given application of the solution.

Claims

1. An energy absorbing and dissipating device for ve-

hicle coupling, having a fork (3), wherein the fork (3) has a pin (7) mounted therein for mounting the lug assembly (1) connecting the vehicle coupling head, and on the rear side of the fork (3) a pin is mounted with a set of cushioning inserts (11), the set of inserts (11) on the side of the fork (3) being secured by a stop plate (5), constituting a limiter for movement in the coupling pulling direction, and on the opposite side by a back plate (6) and a locking element (13), and the entire structure is closed by a locking element (10), constituting a limiter for movement in the coupling pushing direction, the device additionally having a housing (4) in which the other components can move slidingly, and in which the locking element (10) is mounted, **characterized in that**

the housing (4) is shaped like a sleeve,
there is a circumferential fastener (2) on the outside of the housing (4), the fastener (2) having screw holes (2a') for mounting it to the vehicle wall, and cutting knives (15) for cutting the housing surface (4),
the fastener (2) is fitted onto the housing (4) and further clamped onto it with a locking ring (14),
the housing (4) has slots (15a) for knives (15) on the outer surface, where the fastener (2) is located.

2. The device according to claim 1, **wherein** the set of shock-absorbing inserts (11) are elastomeric inserts (11) separated by spacers (12).

3. The device according to claim 1, **wherein** the housing (4) is a sleeve.

4. The device according to claim 3, **wherein** the locking element (10) is a sleeve located inside the housing (4) and threaded to it.

5. The device according to claim 3, **wherein** the housing (4) in the form of a sleeve has at least one cutout (4a) at the rear end running from the edge of the sleeve (4) substantially to the fastener (2).

6. The device according to claim 5, **wherein** the locking element (10) is shaped like a sleeve with flattened walls, with the flattened walls corresponding to the cutouts (4a) in the housing (4), and the locking element (10) is connected to the housing (4) with pins (19) and screws (17).

7. The device according to claim 1, **wherein** the locking element (13) is a nut.

8. The device according to claim 1, **wherein** the housing (4) on the outer surface of the front end has a protrusion (18) that serves as a housing (4) stroke limiter.

9. The device according to claim 8, **wherein** the protrusion runs around the entire circumference of the housing.

10. The device according to claim 5, **wherein** the housing (4) has two cutouts (4a) located at the top and bottom of the housing (4).

11. The device according to claim 1, **wherein** the housing (4) and the locking ring (14) are threaded together.

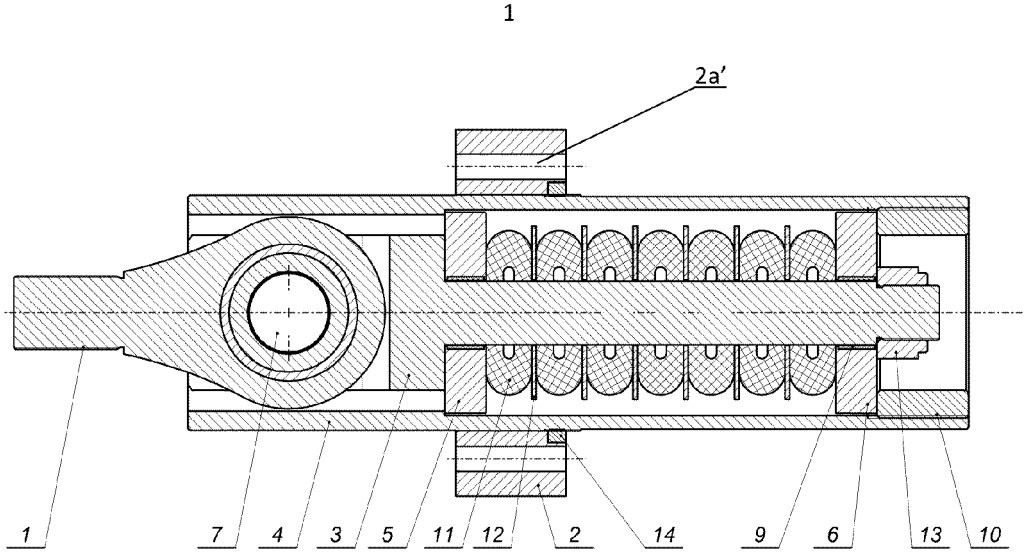

Fig. 1

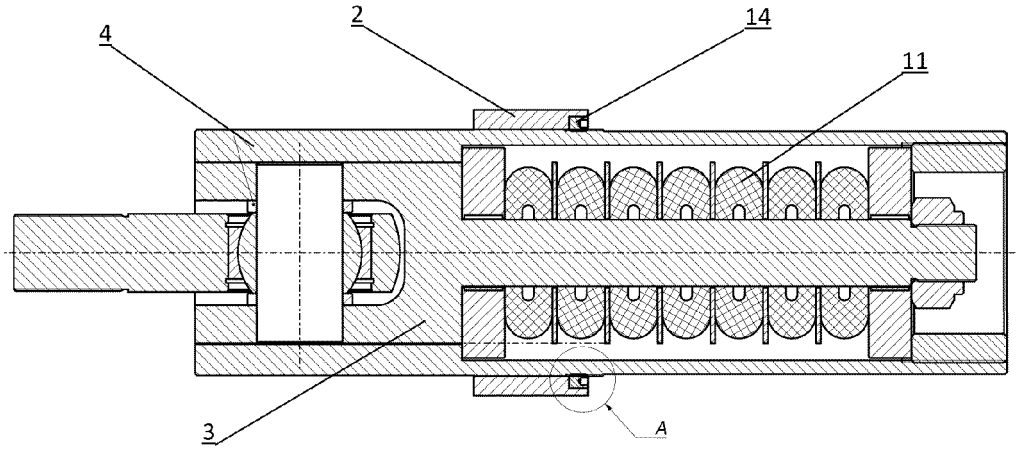

Fig. 2

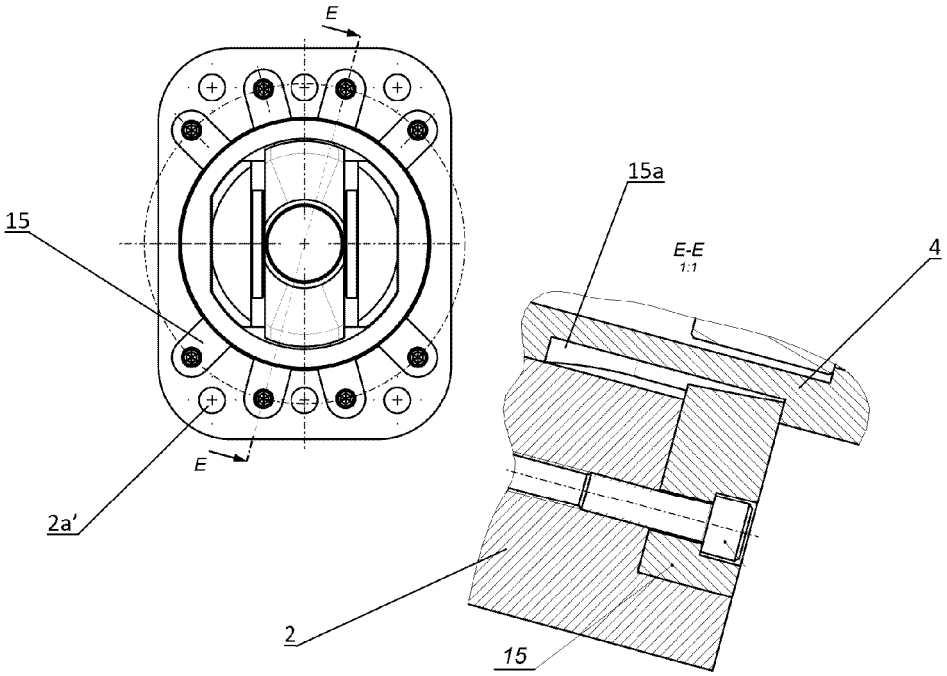

Fig. 3

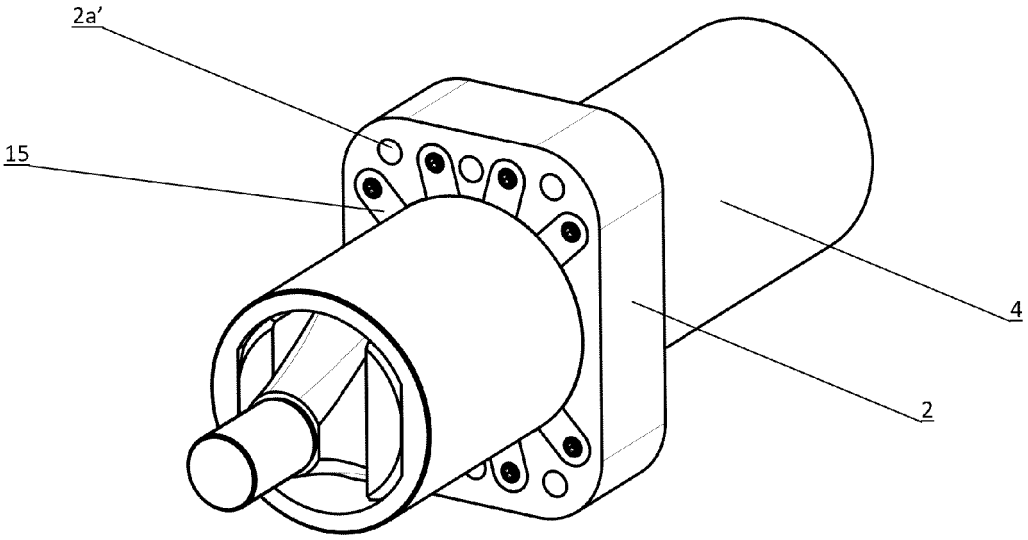

Fig. 4

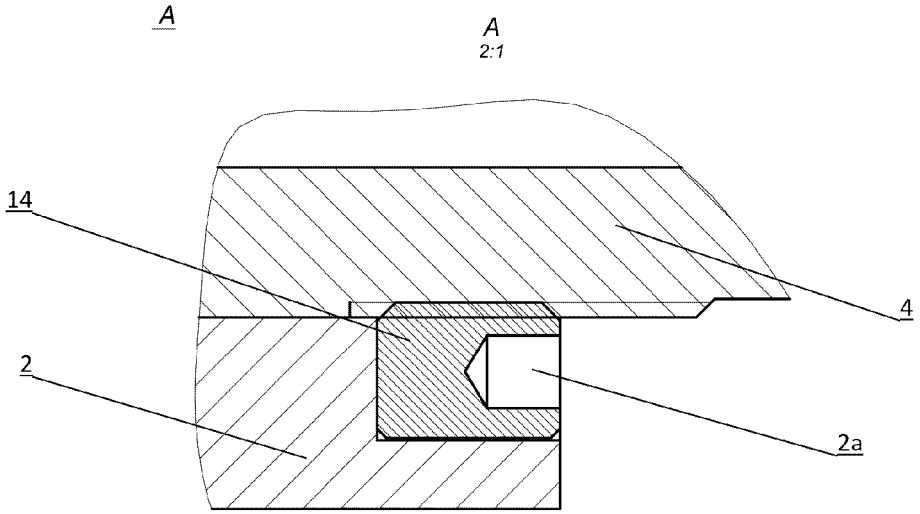

Fig. 5

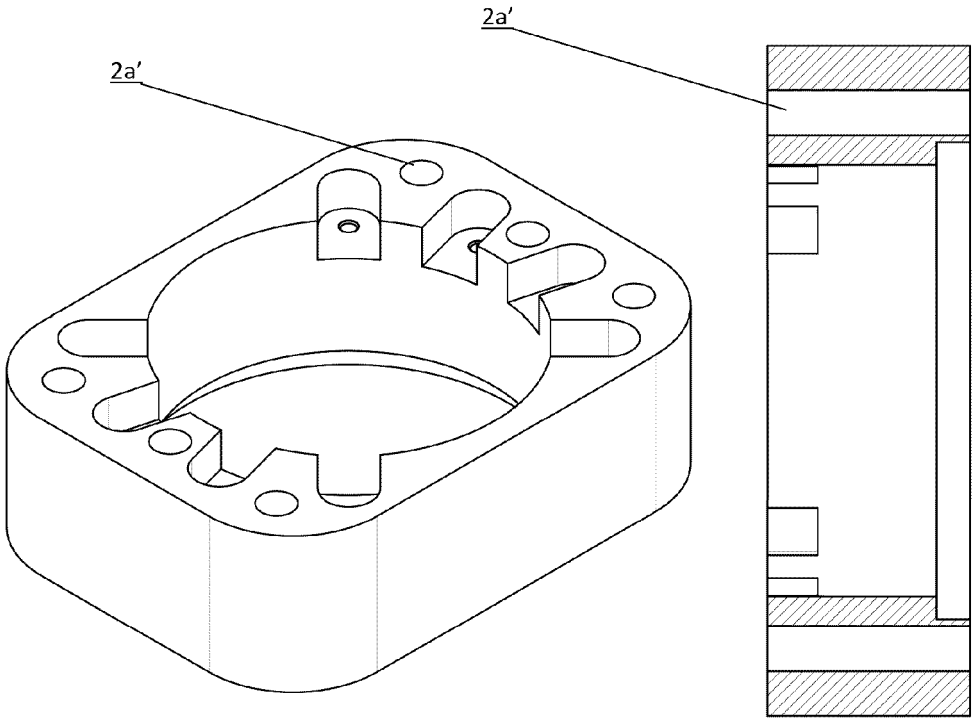

Fig. 6

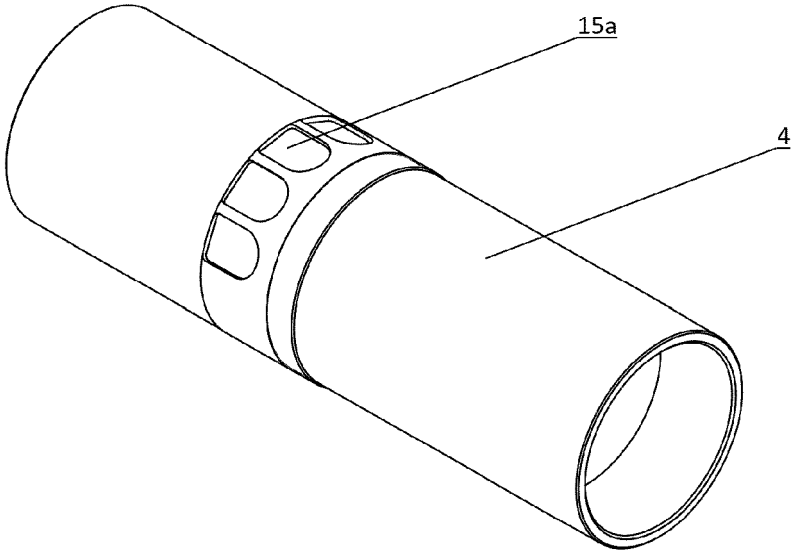

Fig. 7

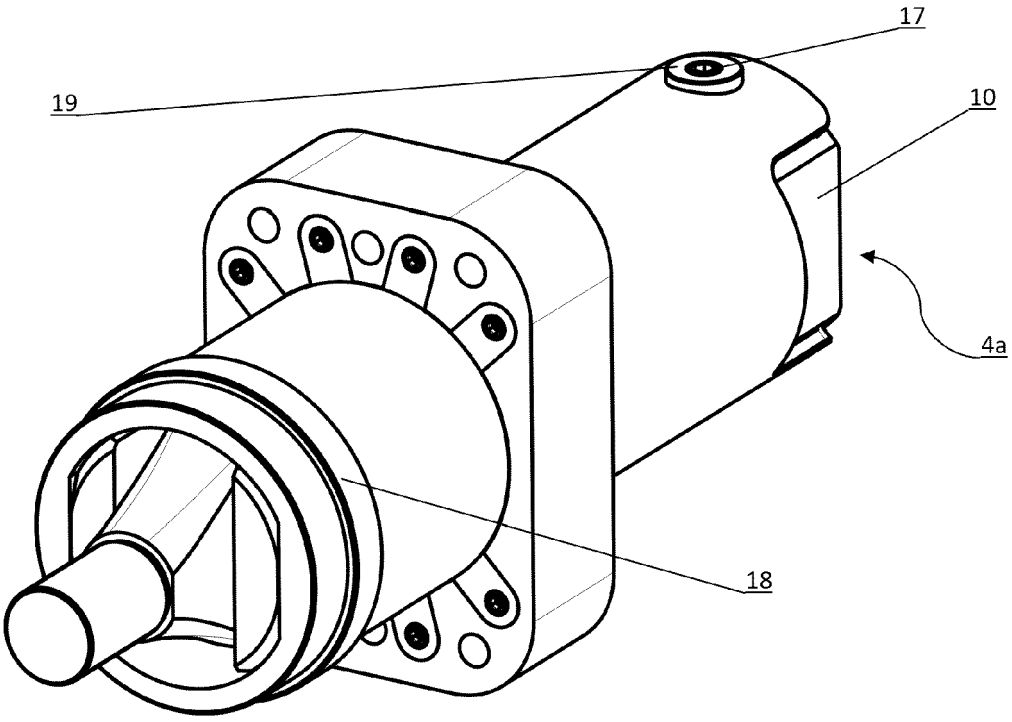

Fig. 8

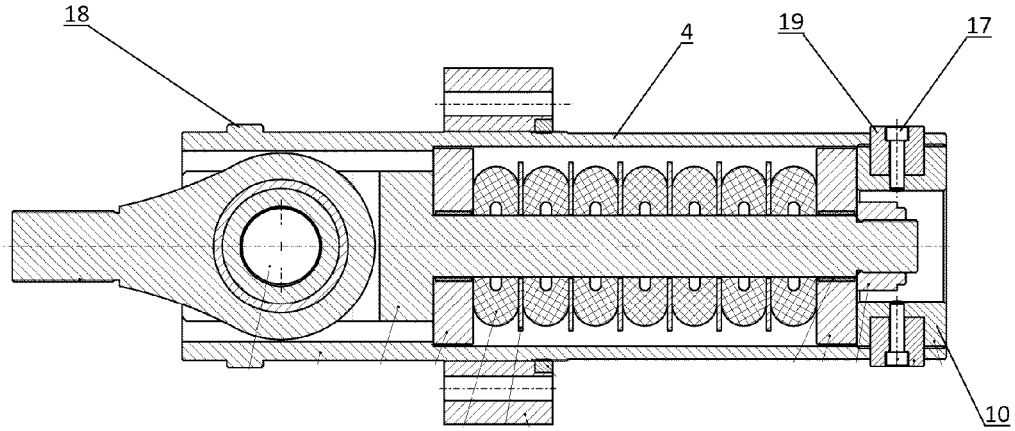

Fig. 9

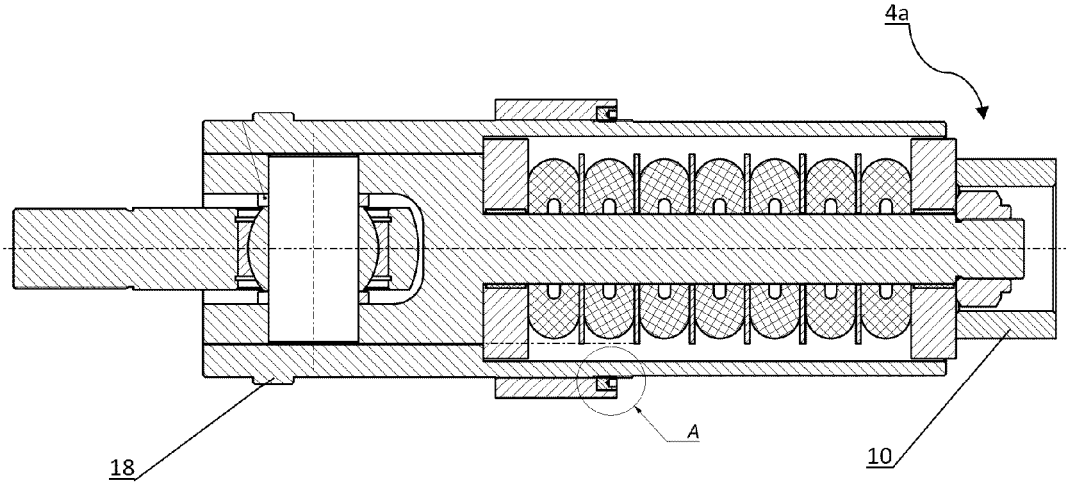

Fig. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 24 21 3532

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 April 2025	Awad, Philippe

CATEGORY OF CITED DOCUMENTS

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