(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 119 295 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.01.2023 Bulletin 2023/03

(21) Application number: **22180959.3**

(22) Date of filing: **24.06.2022**

(51) International Patent Classification (IPC):
B25B 5/12 *(2006.01)* ***B25B 5/16*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B25B 5/16; B25B 5/122

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **02.07.2021 IT 202100017573**

(71) Applicant: **Pneumax S.p.A.**
20129 Milan (IT)

(72) Inventor: **BOTTACINI, Rossella**
Milan (IT)

(74) Representative: **Mati, Silvia et al**
Thinx S.r.l.
P.le Luigi Cadorna, 10
20123 Milano (IT)

(54) ACTUATING UNIT OF THE ARTICULATED LEVER OR CAM TYPE WITH INTEGRATED MANUAL RELEASE

(57) The present invention relates generally to an actuating unit of the articulated lever or cam type with manual release function comprising an actuating element (12) movable between a rest position and a working position; a housing body (11) inside which a closing device (30) is housed, the closing device being configured to move the actuating element (12) between the rest position and the working position, wherein the closing device (30) comprises a mechanism of irreversibility of movement configured to trigger when the actuating element (12) reaches the working position; a linear actuator (20) provided with an axial control rod (21) movable along an actuator axis (A) in such a way as to move an ending (21a) of the control rod (21) connected to the closing device (30) between a first end position and a second end operating position and through which the linear actuator (20) acts on the closing device (30) to move it between an opening condition in which the actuator element (12) is in the rest position and a closing condition in which the actuator element (12) is in the working position; and a release device (40) of the closing device (30) housed inside the housing body (11) rotatably around a rotation axis (B) orthogonal to the actuator axis (A) and characterized in that the release device (40) of the closing device (30) is configured to impart a substantially coaxial thrust to the actuator axis (A) on the control rod (21).

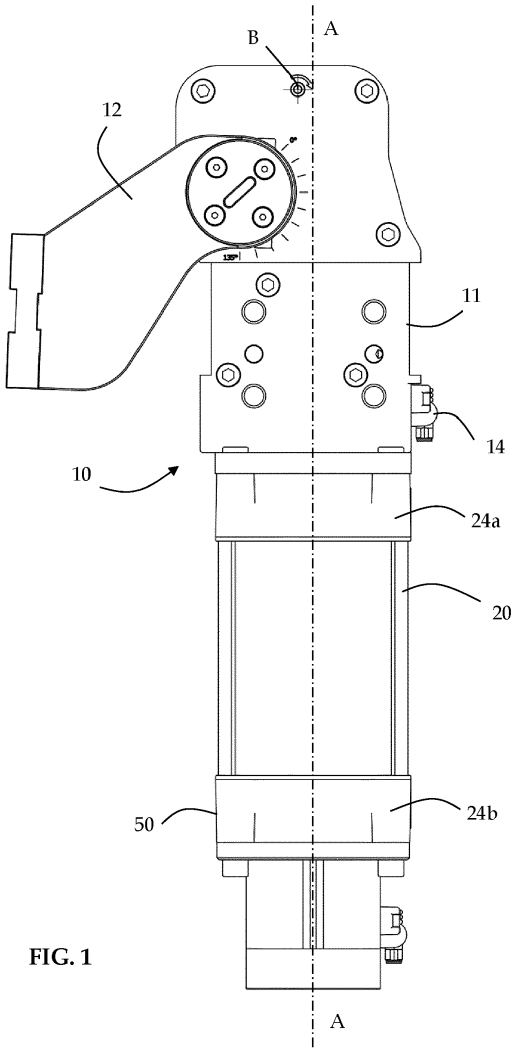

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present invention generally concerns an actuating unit of the articulated lever or cam type with integrated manual release. In particular, the present invention refers to actuating units typically used in the field of sheet metal machining, for example for the manufacture of motor vehicle bodyworks, such as for example pivoting or oscillating units, locating units and clamping units with one or two claiming arms.

[0002] In the field of the manufacture of motor vehicle bodywork, it is known, for example, to use actuating units of the pivoting or oscillating type for the movement of a support arm to which the locking clamps of the metal sheets to be welded and/or parts of equipment can be constrained, while keeping the support arm firmly clamped in a certain position. For this purpose, the known pivoting units comprise a closing device capable of bringing a support arm connected to such a device into an exact operating or working position and, once it has been reached, of maintaining it in that position causing a mechanism of irreversibility to be triggered able to guarantee the position even in the absence of the actuation control, for example in the absence of compressed air in the case of pneumatic control.

[0003] By way of example, the closing device with a mechanism of irreversibility comprises a connecting rod and a crank that are rotatably connected to each other substantially at a respective end. The second end of the connecting rod is controlled to translate, bringing the crank into rototranslation, until reaching a configuration in which the connecting rod and the crank are arranged orthogonal to each other (condition of irreversibility). Once this condition of irreversibility is reached, it is possible to release the closing device only by applying an axial force of return to the second end of the connecting rod.

[0004] In the same field, the use of locating units provided with a rod that is brought and locked in a certain operating or working position by means of a similar closing device provided with a mechanism of irreversibility is also known.

BACKGROUND

[0005] In order to ensure that the actuating arm or the locating rod can return to the opening or rest position even in the absence of a control, the known actuating units are generally equipped with expedients that allow the closing device to be manually unlocked.

[0006] Document DE 20 2013 005 869 describes an actuating unit of the articulated lever type that envisages an opening obtained in the housing body substantially at the height of the area in which the connecting rod and the crank are arranged orthogonal to each other. The opening allows a lean and elongated tool, such as a screwdriver, to gain access to this area and act against a protrusion so as to impart an axial force of return to the closing device.

[0007] However, this solution proves to be impractical as the release from the condition of irreversibility requires imparting high forces, which are difficult to apply through a lean and elongated tool. Furthermore, the opening present in the wall of the housing body is not able to preserve a condition of complete isolation of the moving parts of the actuating unit from the external environment. Considering that the actuating units are often used to perform welding or other machinings that are subject to heavy fouling, isolation from the external environment is an essential condition for preserving the proper functioning of these devices over time.

[0008] From documents US 6,557,840 and WO 2011/042009, actuating units of the articulated lever type are also known which envisage rotating elements placed inside the housing body, but controllable in rotation from the outside of the housing body and configured to engage in a corresponding seat or protrusion made on the control rod that drives the movement of the closing device, specifically the translation of the second end of the connecting rod. When the rotating element is in engagement with the seat or the protrusion, its rotation causes a translation of the control rod and therefore a movement of the closing device away from the configuration of irreversibility, thereby disabling the relative mechanism of irreversibility.

[0009] This solution, in addition to requiring that a high torque be imparted to rotate the rotating elements in order to move the closing device, may also pose a danger of blockage or breakage of the unit in case the rotating element is brought into the configuration of interference when the closing device is not in the configuration of irreversibility.

[0010] The Applicant has therefore perceived a need to realise an actuating unit with integrated manual release function that is not subject to the aforesaid drawbacks.

OBJECTS AND SUMMARY OF THE INVENTION

[0011] In light of the above, the task underlying the present invention is to design an actuating unit with integrated manual release that allows to overcome the drawbacks of the prior art.

[0012] Within the scope of this task, one object of the present invention is to realise an actuating unit with integrated manual release, which enables to operate a manual release of the closing device in the absence of electrical or pneumatic control in a simple and reliable way.

[0013] Another object of the present invention is to devise an actuating unit with integrated manual release that does not entail the risk of blocking or damaging it.

[0014] Last but not least, the object of the present invention is to design an actuating unit with integrated manual release capable of preserving the condition of com-

plete isolation of the moving parts of the actuating unit from the external environment.

[0015] In accordance with a first aspect thereof, the invention thus concerns an actuating unit of the articulated lever or cam type comprising an actuator element movable between a rest position and a working position, a housing body inside which a closing device is housed, the closing device being configured to move the actuator element between the rest position and the working position, wherein the closing device comprises a mechanism of irreversibility of movement configured to trigger when the actuator element reaches the working position, and a linear actuator provided with an axial control rod movable along an actuator axis A in such a way as to move an ending of the control rod connected to the closing device between a first end position and a second operating end position and through which the linear actuator acts on the closing device to move it between an opening condition in which the actuator element is in the rest position and a closed position in which the actuator element is in the working position.

[0016] Further, the actuating unit comprises a release device of the closing device housed inside the housing body in a rotatable manner around a rotation axis B orthogonal to the actuator axis A. Advantageously, the release device is configured to impart a substantially coaxial thrust to the actuator axis A on the control rod.

[0017] The Applicant has identified that thanks to the particular positioning of the release device it is possible to release the device by means of a reduced torque with respect to the state of the art. In fact, the possibility of acting on the control rod with a substantially coaxial thrust to that rod makes it possible to reduce the torque arm, thus increasing the force exerted at the same torque.

[0018] Furthermore, the positioning of the release device such as to impart a substantially coaxial thrust on the control rod prevents situations in which said release device acts as an obstacle to the movement of the control rod. This essentially eliminates the possibility of damage to the actuating unit, e.g. due to the activation of the release device when the unit is not in the condition of irreversibility.

[0019] In accordance with a further aspect, the invention concerns an actuating unit of the articulated lever or cam type comprising a housing body inside which a closing device is housed which comprises a mechanism of irreversibility of movement; a linear actuator provided with an axial control rod movable along an actuator axis between a first end position and a second operating end position, wherein the axial control rod acts on the closing device and the mechanism of irreversibility is configured to trigger when the axial control rod reaches the second operating end position; and a release device of the closing device is housed inside the housing body in a rotatable manner around a rotation axis orthogonal to the actuator axis. According to the invention the release device of the closing device is configured to impart a substantially coaxial thrust to the actuator axis on the control rod.

[0020] The present invention may have at least one of the preferred following features; the latter may in particular be combined with one another as desired in order to meet specific application needs.

[0021] In a variant of the invention, the release device is configured to exert the thrust directly on the ending of the control rod connected to the closing device and/or directly on the closing device where the closing device is connected to the control rod.

[0022] Advantageously, such a release device is particularly efficient and reliable, acting directly on the parts that need to be moved.

[0023] In a variant of the invention, the release device is configured to exert the thrust along the actuator axis A.

[0024] In a different variant of the invention, the release device is configured to exert the thrust along a direction parallel to the actuator axis A and offset from the actuator axis A by a distance d' less than 80% of a cross section radius r of the control rod, preferably less than 50% of the cross section radius r of the control rod, more preferably less than 30% of the cross section radius r of the control rod.

[0025] Such an embodiment guarantees an optimised action of the release device without the need for high torques to be applied.

[0026] In a variant of the invention, the release device is arranged in the housing body at an axial height external to an interval defined between the first end position and the second operating end position between which the ending of the control rod connected to the closing device is movable.

[0027] This positioning effectively prevents any damage to the actuating unit due to an activation of the release device when the unit is not in the condition of irreversibility.

[0028] In a variant of the invention, the release device comprises a lever or the cam movable between a non-operating position and a thrust position in which the lever or the cam imparts the substantially coaxial thrust to the actuator axis A on the control rod.

[0029] Preferably, the lever or the cam is pivoted to the housing body proximal to the second operating end position reachable by the ending of the control rod.

[0030] Advantageously, such placement allows to obtain an automatic return of the release device to the non-activated condition. In fact, the movement of the control rod towards the maximum extraction position, therefore, towards the second operating end position, causes a thrust of the lever that brings it back into the non-operating position.

[0031] Preferably, the lever or the cam is at least partially housed in a housing recess obtained in a thickness of a wall of the housing body, the recess facing towards a hollow housing defined internally of the housing body and in which the closing device is housed.

[0032] The placement in a recess obtained in the thickness of a wall of the housing body allows the release device to be integrated without affecting the overall di-

mensions of the housing body.

[0033] Preferably, in the non-operating position, the lever or the cam is arranged in the recess according to an arrangement of minimum protrusion from the recess.

[0034] Advantageously, this embodiment allows to keep the overall dimensions of the release device inside the housing body to a minimum.

[0035] Preferably, the lever or the cam is rotatably connected to the housing body via a pin constrained to the housing body in such a way as to have at least one end of the pin accessible from the outside of the housing body.

[0036] More preferably, the pin is constrained to the housing body in such a way as to have both ends of the pin accessible from the outside of the housing body.

[0037] In a variant of the invention, the recess is shaped to realise a stroke-end for limiting the rotation of the lever.

[0038] In a different variant of the invention, the recess is shaped to realise a stroke-end for limiting the rotation of the pin.

[0039] In a variant of the invention, the linear actuator is either a pneumatic actuation cylinder fixedly connected to the housing body or a pneumatic actuator integrated into the housing body.

[0040] In one variant of the invention, the actuating unit is a pivoting or oscillating unit, a locating unit or a clamping unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] Further features and advantages of the present invention will be more evident from the following detailed description of certain preferred embodiments thereof made with reference to the appended drawings.

[0042] The different features in the individual configurations may be combined with one another as desired according to the preceding description, should there be advantages specifically resulting from a specific combination.

[0043] In such drawings,

- Figure 1 is a side elevation view of a first preferred embodiment of the actuating unit according to the invention, specifically a pivoting unit, in the substantially closed configuration but with the mechanism of irreversibility not triggered;
- Figure 2 is a side elevation and partially sectional view of the actuating unit of Figure 1 in the closed configuration, with the mechanism of irreversibility triggered;
- Figure 2a is an enlarged detail of Figure 2;
- Figure 3 is a side elevation and sectional view of the actuating unit of Figure 1 in the substantially closed configuration, with the mechanism of irreversibility not triggered;
- Figure 3a is an enlarged detail of Figure 3;
- Figure 4 schematically shows the control rod of the actuating unit of Figure 1 in section;
- Figure 5 is a side elevation view of a second preferred embodiment of the actuating unit according to the invention, specifically a locating unit, in the opening configuration;
- Figure 6 is a side elevation and sectional view of the actuating unit of Figure 5, in the closed configuration, with the mechanism of irreversibility triggered;
- Figure 6a is an enlarged detail of Figure 6;
- Figure 7 is a side elevation and sectional view of the actuating unit of Figure 5 in the substantially closed configuration, with the mechanism of irreversibility not triggered; and
- Figure 7a is an enlarged detail of Figure 7.

DETAILED DESCRIPTION OF THE INVENTION

[0044] For the illustration of the drawings, use is made in the following description of identical numerals or symbols to indicate construction elements with the same function. Moreover, for clarity of illustration, certain references may not be repeated in all drawings.

[0045] While the invention is susceptible to various modifications and alternative constructions, certain preferred embodiments are shown in the drawings and are described hereinbelow in detail. It is in any case to be noted that there is no intention to limit the invention to the specific embodiment illustrated rather on the contrary, the invention intends covering all the modifications, alternative and equivalent constructions that fall within the scope of the invention as defined in the claims.

[0046] The use of "for example", "etc.", "or" indicates non-exclusive alternatives without limitation, unless otherwise indicated. The use of "comprises" and "includes" means "comprises or includes, but not limited to", unless otherwise indicated.

[0047] With reference to Figures 1-4, a first preferred embodiment of an actuating unit with articulated lever according to the present invention, indicated as a whole with 10, specifically realised in the form of a rotating unit is illustrated.

[0048] The rotating unit 10 comprises a housing body 11 inside which a closing device 30 is arranged. The housing body 11 is defined by four side walls closed below by a lower wall lib and above by an upper wall 11a, opposed to the lower wall 11b. The walls of the housing body 11 define, inside the same 11, a hollow housing 14 that houses the closing device 30 in a housing area close to the upper wall 11a.

[0049] The closing device 30 is integrally connected to

an actuator element that in the embodiment of Figures 1-4 is realised in the form of an actuating arm 12 and is switchable between a first configuration, in which the actuating arm 12 is brought into an angular rest position, and a second configuration, in which the actuating arm 12 is brought into an angular working position or operating position.

[0050] The rotating unit 10 further comprises a linear actuator 20 provided with an axial control rod 21 (shown in Figures 2 and 3) movable along an actuator axis A. In the embodiment illustrated, the linear actuator 20 is a pneumatic actuation cylinder fixedly connected to the housing body 11 at the lower wall lib of the body 11. As shown in detail in Figures 2 and 3, the pneumatic actuation cylinder 20 comprises a body of the actuator, in this case a cylinder body 23, which internally defines a sealing chamber 29 delimited by two heads 24a,24b arranged respectively at the axial ends of the cylinder body 23. An upper head 24a is sealingly crossed by the control rod 21 which then protrudes beyond it extending with a first ending 21a along the actuator axis A and up to the closing device 30 where it is connected thereto. At a second ending thereof housed inside the chamber 29 defined by the cylinder body 23, the rod 21 is constrained to a first plunger 22 mounted axially sliding and sealingly inside said chamber 29.

[0051] The axial control rod 21 acts on the closing device 30 inside the body 11 to move it between an opening and a closed condition. To this end, the control rod 21 is movable along the actuator axis A between two end configurations: a first configuration of maximum insertion into the cylinder body 23 and a second configuration of maximum extraction from the cylinder body 23. Moving from the first to the second configuration, the first ending 21a of the control rod 21 connected to the closing device 30 moves between two axial end positions that define an axial path travelled by the first ending 21a of the control rod 21.

[0052] In the embodiment shown in Figures 2 and 3, the closing device 30 is of the articulated lever type and comprises a connecting rod 31 and a crank 32 connected together in a rotatable manner substantially at one respective end. The control rod 21 is rotatably constrained to another end of the connecting rod 31 of the closing device 30. The crank 32 is rotatably constrained at another end thereof to the body 11 of the actuating unit 10 and is provided with a pair of coaxial pins 12a which protrude from opposed sides of said body 11 of the actuating unit 10. The actuating arm 12 is integrally constrained to the coaxial pins 12a, thus being brought into rotation by the movement of the crank 32. The connecting rod 31 - crank 32 assembly thus shaped and constrained realises a mechanism of irreversibility of the closing device 30. In fact, once a configuration is reached in which the connecting rod and the crank are arranged orthogonal to each other, it is possible to release the closing device only by applying an axial force of return to the second end of the connecting rod.

[0053] When the first ending 21a of the control rod 21 is in the end position corresponding to the maximum extraction configuration, the closing device 30 is in the closed condition with the mechanism of irreversibility triggered.

[0054] The actuating unit 10 of Figures 1-3 further comprises a release device 40 of the closing device 30 realised in the form of a lever 41 pivoted to the housing body 11. In particular, the lever 41 is rotatably connected to the housing body 11 via a pin 42 constrained to the housing body in such a way as to have at least its ends accessible from the outside of the housing body 11. In detail, the pin 42 comprises at least one actuation interface, accessible from the outside, which is shaped in such a way as to cooperate with an actuation tool (not illustrated) to be rotated by the same, such as a screwdriver or an allen key.

[0055] According to the present invention, the lever 41 of the release device 40 is positioned inside the housing body 11 so as to impart a substantially coaxial force to the actuator axis A on the control rod 21. Specifically, the lever 41 is positioned inside the housing body 11 so as to impart a substantially coaxial force to the actuator axis A, either directly on the first ending 21a of the control rod 21 connected to the closing device 30 or on the closing device 30 itself where it is connected to the control rod 21. To this end, the lever 41 is arranged inside the housing body 11 at an axial height external to the axial path travelled by the first ending 21a of the control rod 21.

[0056] Within the scope of this description and in the accompanying claims, "axial height" means the height at which an element is located with respect to a direction parallel or coincident with the actuation axis A.

[0057] Within the scope of this description and in the accompanying claims, the expression "force or substantially coaxial thrust to the actuator axis A" is understood to mean a force or thrust applied along the actuator axis A or along a direction parallel to the actuator axis A and offset from the actuator axis A by a distance d less than 80% of a cross section radius r of the rod 21, preferably less than 50% of a cross section radius r of the rod 21, more preferably less than 30% of a cross section radius r of the rod 21, with reference to the quantities illustrated in Figure 4.

[0058] To this end, the release device 40 is advantageously housed inside the housing body 11 proximal to the housing area in which the closing device 30 is arranged, in particular at the upper wall 11a of the housing body 11. The lever 41 is movably constrained to the housing body 11 between a non-operating position, substantially parallel and adjacent to a wall of the housing body 11, in particular to the upper wall 11a, and a thrust position, in which the lever 41 protrudes more from the upper wall 11a towards the inside of the housing body 11. According to a preferred embodiment, the wall of the housing body 11 has a recess 14a obtained in the thickness of the housing body 11 facing towards the hollow housing 14 defined internally of the housing body 11, wherein the

lever 41 is at least partially housed when it is in its non-operating position in such a way as to assume a configuration of minimum protrusion from the recess 14a.

[0059] The recess 14a is also shaped in such a way as to realise a stroke-end 14a' for the rotation of the lever 41. The stroke-end prevents the lever 41 from assuming a configuration parallel to the actuator axis A, thereby ensuring that the lever 41 can never prevent the control rod 21 from reaching the end position corresponding to the maximum extraction configuration, in which the closing device 30 is in the closing condition with the mechanism of irreversibility triggered.

[0060] With reference to Figures 5 - 7, a second preferred embodiment of an actuating unit with articulated lever according to the present invention, indicated as a whole with 10, specifically realised in the form of a locating unit is illustrated.

[0061] The locating unit 10' comprises a housing body 11 which defines therein a hollow housing 14 in which a closing device 30 and the axial control rod 21 of a linear actuator 20 are arranged.

[0062] The closing device 30 is integrally connected to an actuator element - realised in the form of a locating rod 12' - to move it between a linear rest position, in which the rod 12' is partially inserted into the housing body 11, and a linear working position or operating position, in which the rod 12' is completely extracted from the housing body 11.

[0063] In the embodiment of Figures 5-7, the closing device 30 is of the articulated lever type and comprises a connecting rod 31 and a crank 32 connected to each other in a rotatable manner substantially at one respective end. The control rod 21 is rotatably constrained to another end of the connecting rod 31 of the closing device 30. The crank 32 comprises two shanks arranged in an L-shape, is fulcrated where the two shanks join (fulcrum 33) and, at the second end thereof, is rotatably constrained to a second connecting rod 15 in turn rotatably connected to the locating rod 12'.

[0064] The closing device 30 is controlled in opening/closing by the control rod 21 of the linear actuator 20, which specifically is a pneumatically operated actuator. The control rod 21 is movable along an actuator axis A between two end configurations: a first configuration of maximum insertion into a sealing chamber 29' for the supply of compressed air and a second configuration of maximum extraction from the sealing chamber 29'. Moving from the first to the second configuration, the first ending 21a of the control rod 21 connected to the closing device 30 moves between two axial end positions that define the axial path travelled by the first ending 21a of the control rod 21.

[0065] The locating unit 10' also comprises a release device 40 of the closing device 30 realised in the form of a cam 41' extending from the surface of a cylindrical pin 42 rotatably connected to the housing body 11. The pin 42 is constrained to the housing body 11 in such a way as to have its ends accessible from the outside of the housing body 11. In detail, the pin 42 comprises at least one actuation interface, accessible from the outside, which is shaped in such a way as to cooperate with an actuation tool (not illustrated) to be rotated by the same, such as a screwdriver or an allen key.

[0066] With reference to the second embodiment, the cam 41' of the release device 40 is positioned in the housing body 11 so as to impart a substantially coaxial force to the actuator axis A on the control rod 21 when the pin 42 is brought into rotation. Specifically, the cam 41' is positioned inside the housing body 11 in such a way as to impart a substantially coaxial thrust to the axis A, either directly on the first ending 21a of the control rod 21, substantially where the control rod 21 is connected to the closing device 30 or on the closing device 30 itself where it is connected to the control rod 21. To this end, the cam 41' is arranged inside the housing body 11 at an axial height external to the axial path travelled by the first ending 21a of the control rod 21.

[0067] To this end, the pin 42 is advantageously housed in a recess 14a obtained in the thickness of the housing body 11 and such that it faces towards the hollow housing 14. In particular, the recess 14a faces towards the area of the hollow housing 14 where the closing device 30 is located. The cam 41' is movably constrained to the housing body 11 between a non-operating position, in which the cam 41' protrudes minimally or substantially does not protrude from the recess 14a in the direction of the actuator axis A (shown in the enlarged detail of Figure 6a), and a thrust position, in which the cam 41' protrudes more from the recess 14a in the direction of the actuator axis A (shown in the enlarged detail of Figure 7a).

[0068] There is also provided a stroke-end 14a' configured to limit the rotation of the pin 42 and, in this way, prevent the cam 41' from being able to assume a configuration such as to prevent the control rod 21 from reaching the end position, corresponding to the configuration of maximum extraction, in which the closing device 30 is in the closed condition with the mechanism of irreversibility triggered.

[0069] The operation of the actuating unit 10,10' with articulated lever or cam according to the present invention is as follows.

[0070] In the closed condition, illustrated in Figures 2 and 2a and Figures 6 and 6a, respectively, the first ending 21a of the control rod 21 is in the first end position corresponding to the configuration of maximum protrusion from the cylinder body 23. In this condition, the lever 41, or respectively the cam 41', of the release device 40 is in its position of non-operation or of minimum protrusion from the recess 14a in the direction of the actuator axis A.

[0071] In this condition, the mechanism of irreversibility of the closing device 30 is triggered in such a way that any force applied to the actuator arm 12 or on the locating rod 12' - lower than a breaking force of the closing device 30 - is not able to return it to the rest position. In order to disable the mechanism of irreversibility of the closing device 30, it is therefore necessary to apply an axial force

of return of the rod 21 in the direction of the end position opposed to the first one. In the absence of control, the axial force can be applied by rotating the pin 42 of the release device 40. To this end, it is possible to act on at least one of the ends of the pin 42 that are accessible from the outside of the housing body 11.

[0072] The movement of the pin 42 results in a corresponding rotation of the lever 41 or, respectively, of the cam 41', around said pin 42, so as to assume the protruding thrust position. Through the rotation of the lever 41 or, respectively, of the cam 41', an axial thrust is exerted on the rod 21, which causes it to retract towards the inside of the sealing chamber 29,29', thereby causing the closing device 30 to exit the condition of irreversibility (condition illustrated in Figures 3 and 3a as well as in Figures 7 and 7a). At this point, since the mechanism of irreversibility is disabled, it is possible to act directly on the actuator arm 12 or on the locating rod 12' to return them to the rest position.

[0073] Advantageously, a return of the rod 21 to the position of maximum protrusion from the sealing chamber 29,29' is not prevented by the lever 41 or, respectively, by the cam 41', not even when it is in its thrust position. This movement of return of the rod 21 is in fact able to independently return the lever 41 or, respectively, the cam 41', to its non-operating position, i.e. of minimum protrusion from the recess 14a with respect to the direction of the actuator axis A.

Claims

1. Actuating unit (10,10') of the articulated lever or cam type comprising:

   - an actuator element (12,12') movable between a rest position and a working position;
   - a housing body (11) inside which a closing device (30) is housed, the closing device being configured to move the actuator element (12.12') between the rest position and the working position, wherein the closing device (30) comprises a mechanism of irreversibility of movement configured to trigger when the actuator element (12,12') reaches the working position;
   - a linear actuator (20) provided with an axial control rod (21) movable along an actuator axis (A) so as to move an ending (21a) of the control rod (21) connected to the closing device (30) between a first end position and a second operating end position, and through which the linear actuator (20) acts on the closing device (30) to move it between an opening condition in which the actuator element (12,12') is in the rest position and a closed condition in which the actuator element (12,12') is in the operating position; and
   - a release device (40) of the closing device (30) housed inside the housing body (11) in a rotatable manner around a rotation axis (B) orthogonal to the actuator axis (A),

   characterized in that the release device (40) of the closing device (30) is configured to impart a substantially coaxial thrust to the actuator axis (A) on the control rod (21).

2. Actuating unit (10,10') according to claim 1, wherein the release device (40) is configured to exert the thrust directly on the ending (21a) of the control rod (21) connected to the closing device (30) and/or directly on the closing device (30) where the closing device (30) is connected to the control rod (21).

3. Actuating unit (10,10') according to claim 1 or 2, wherein the release device (40) is configured to exert the thrust along the actuator axis (A).

4. Actuating unit (10,10') according to claim 1 or 2, wherein the release device (40) is configured to exert the thrust along a direction parallel to the actuator axis (A) and offset from the actuator axis (A) by a distance (d) less than 80% of a cross section radius (r) of the control rod (21), preferably less than 50% of a cross section radius (r) of the control rod (21), more preferably less than 30% of a cross section radius (r) of the control rod (21).

5. Actuating unit (10,10') according to any one of the preceding claims, wherein the release device (40) is arranged in the housing body (11) at an axial height external to an interval defined between the first end position and the second operating end position between which the ending (21a) of the control rod (21) connected to the closing device (30) is movable.

6. Actuating unit (10,10') according to any one of the preceding claims, wherein the release device (40) comprises a lever (41) or a cam (41') movable between a non-operating position and a thrust position, wherein the lever (41) or the cam (41') imparts the substantially coaxial thrust to the actuator axis (A) on the control rod (21).

7. Actuating unit (10,10') according to claim 6, wherein the lever (41) or the cam (41') is pivoted to the housing body (11) proximal to the second operating end position that can be assumed by the ending of the control rod (21a).

8. Actuating unit (10,10') according to claim 6 or 7, wherein the lever (41) or the cam (41') is at least partially housed in a housing recess (14a) obtained in a thickness of a wall of the housing body (11), the recess facing towards a hollow housing (14) defined internally of the housing body (11) and in which the

closing device (30) is housed.

9. Actuating unit (10,10') according to any one of claims 6 to 8, wherein in the non-operating position, the lever (41) or the cam (41') is arranged in the recess (14a) according to an arrangement of minimum protrusion from the recess (14) along a direction parallel to the actuator axis (A).

10. Actuating unit (10,10') according to any one of claims 6 to 9, wherein the lever (41) or the cam (41') is rotatably connected to the housing body (11) via a pin (42) constrained to the housing body in such a way as to have at least one end of the pin accessible from the outside of the housing body (11).

11. Actuating unit (10,10') according to claim 10, wherein the pin (42) is constrained to the housing body in such a way as to have both ends of the pin accessible from the outside of the housing body (11).

12. Actuating unit (10,10') according to any one of claims 8 to 11, wherein the recess (14a) is shaped to realise a stroke-end (14a') for limiting the rotation of the lever (41).

13. Actuating unit (10,10') according to claim 10 or 11, wherein the recess (14a) is shaped to realise a stroke-end (14a') for limiting the rotation of the pin (42).

14. Actuating unit (10,10') according to any one of the preceding claims, wherein the linear actuator (20) is a pneumatic actuation cylinder fixedly connected to the housing body (11) or is a pneumatic actuator integrated in the housing body (11).

15. Actuating unit (10,10') according to any one of the preceding claims, realised as a pivoting or oscillating unit, as a locating unit or as a clamping unit.

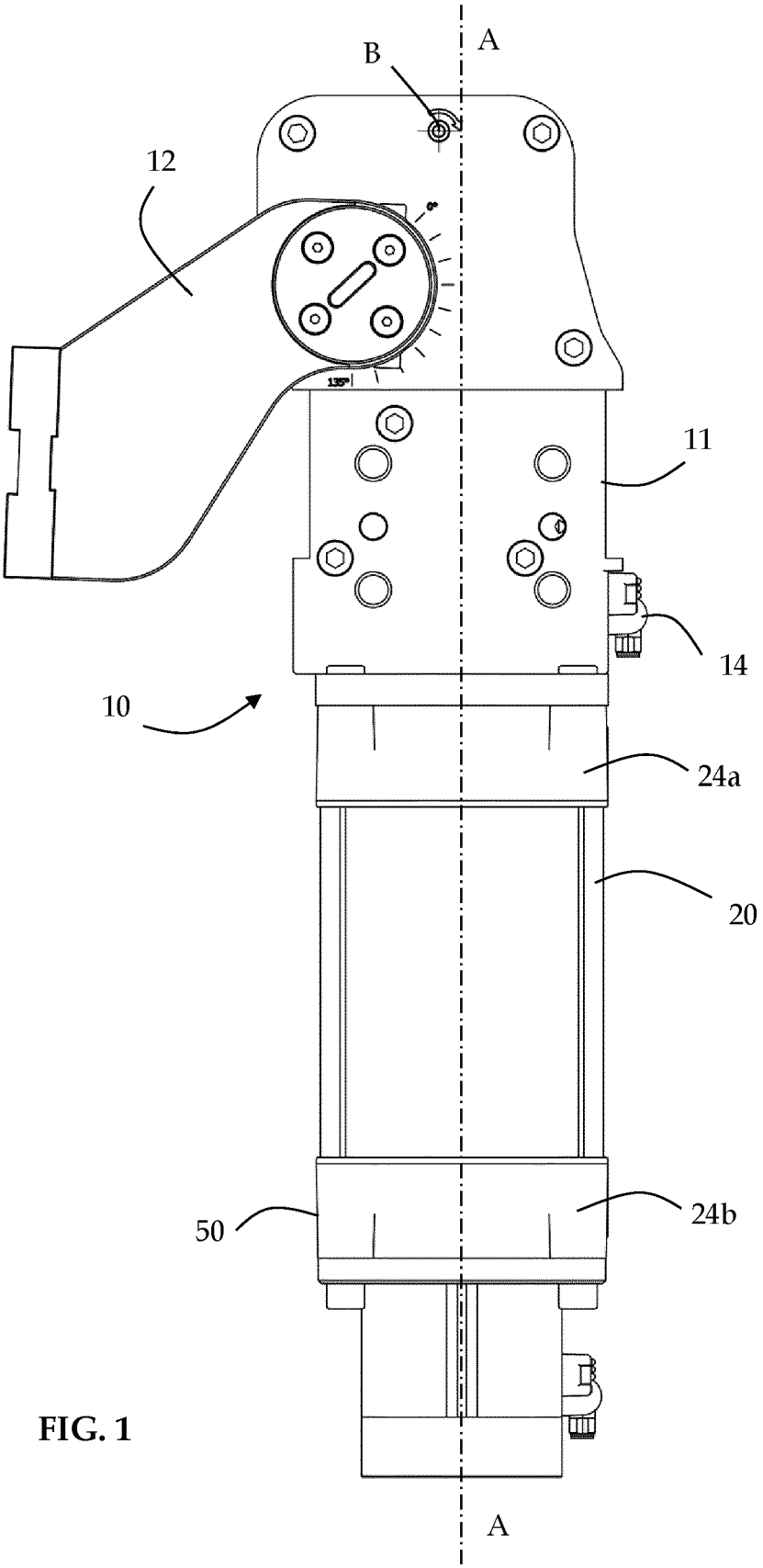

FIG. 1

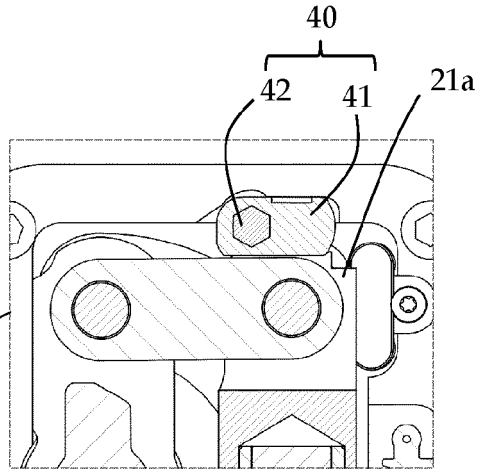
40
42
41
21a

FIG. 2a

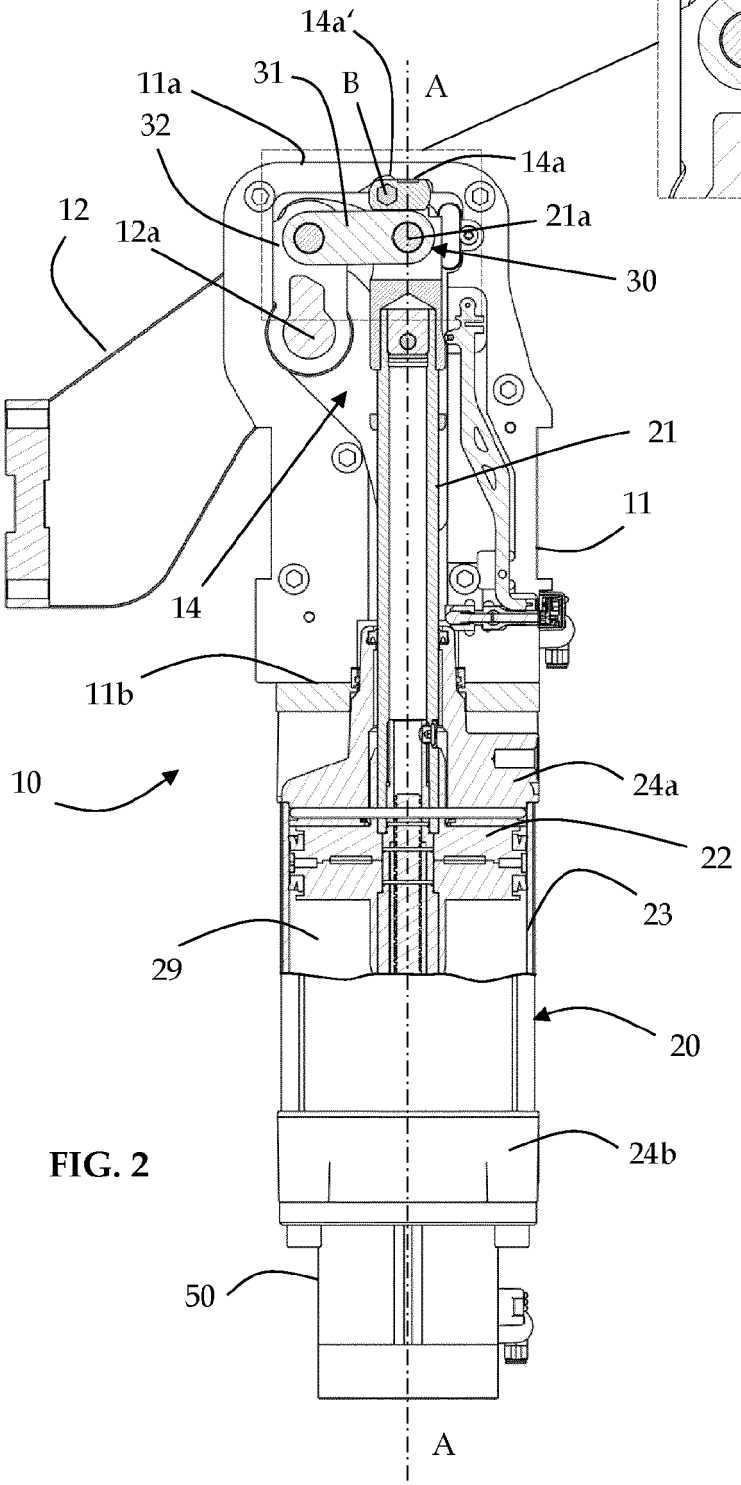
14a'
11a
31
B
A
32
14a
12
21a
12a
30
21
11
14
11b
10
24a
22
23
29
20
24b
50
A

FIG. 2

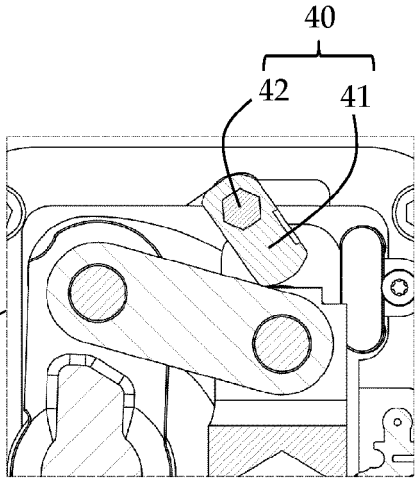

FIG. 3a

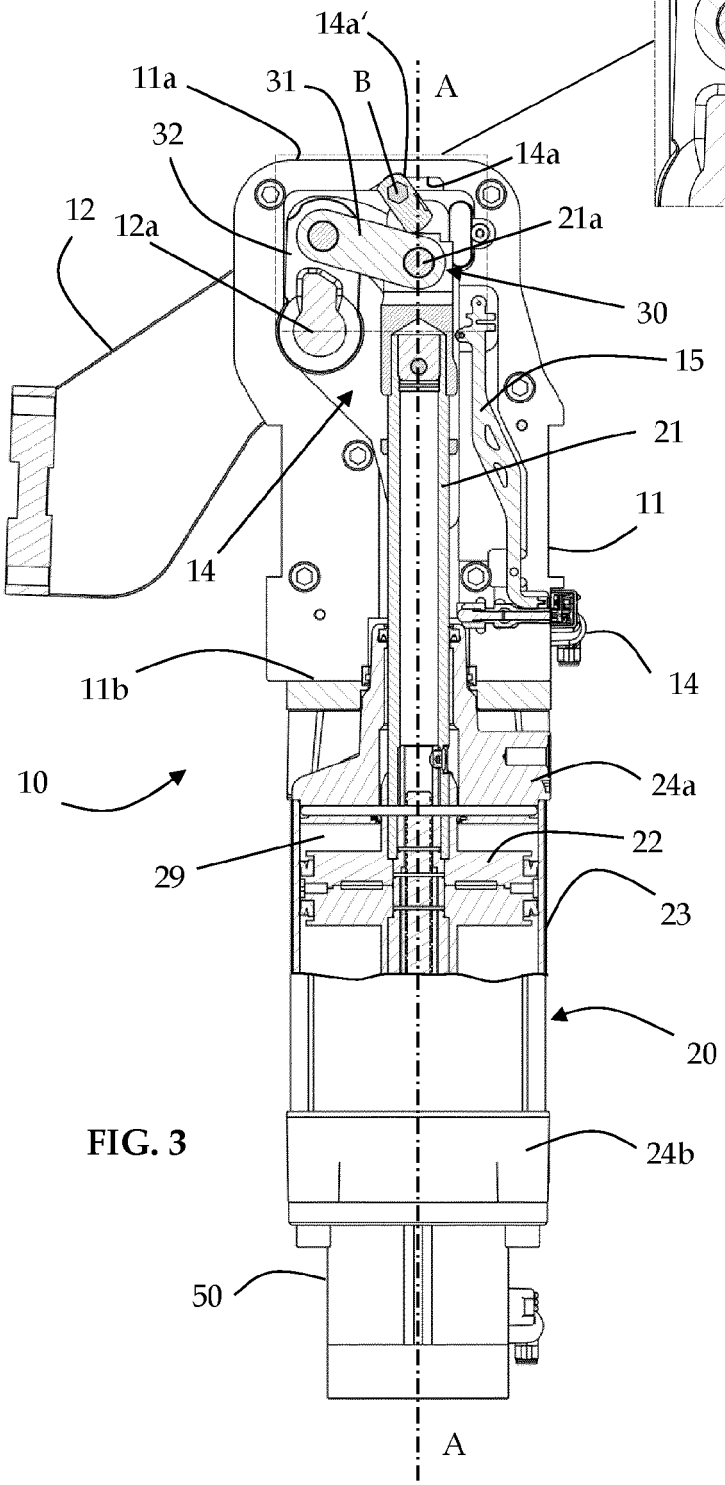

FIG. 3

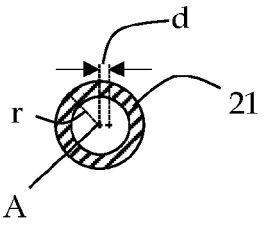

FIG. 4

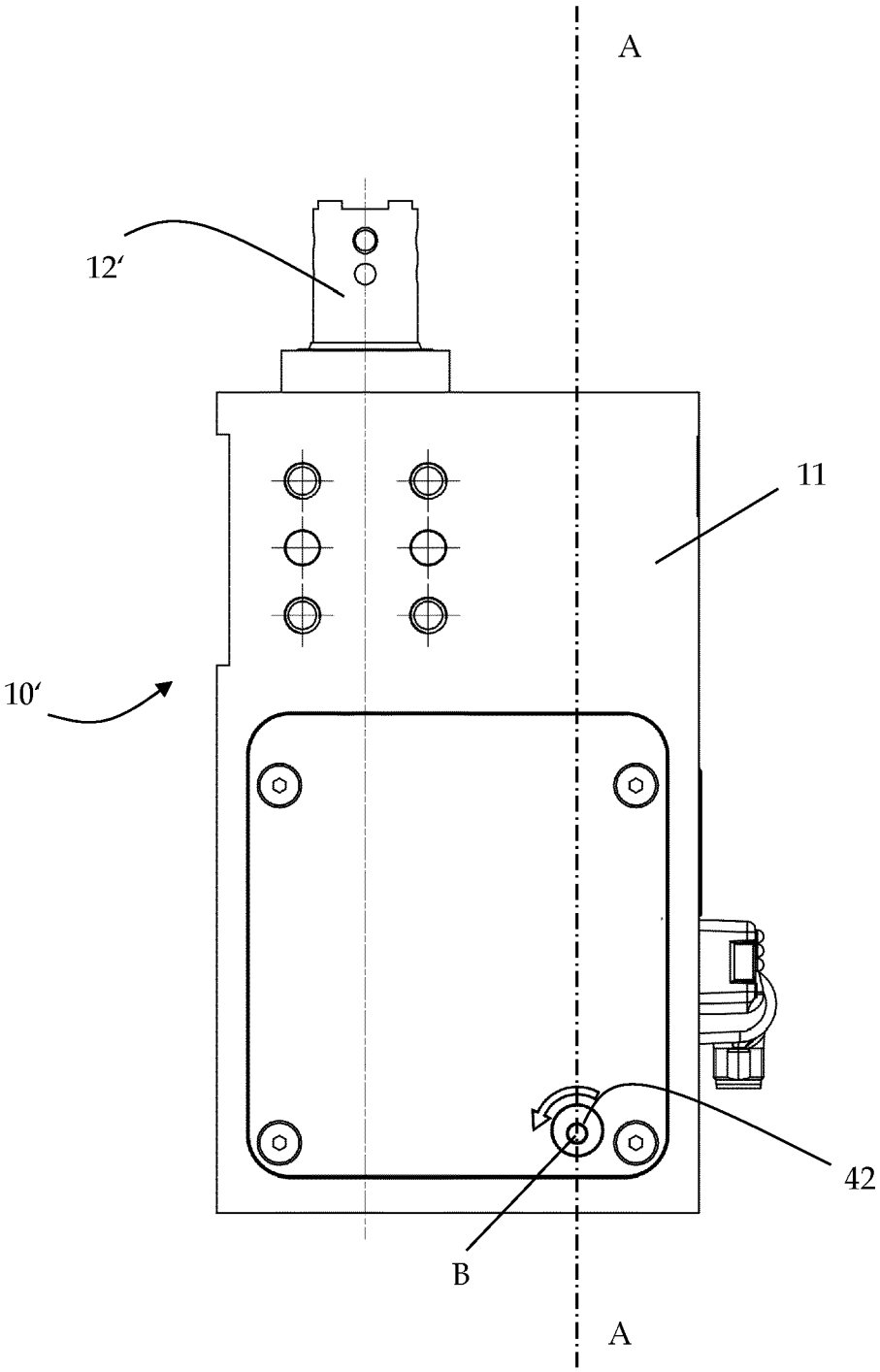

FIG. 5

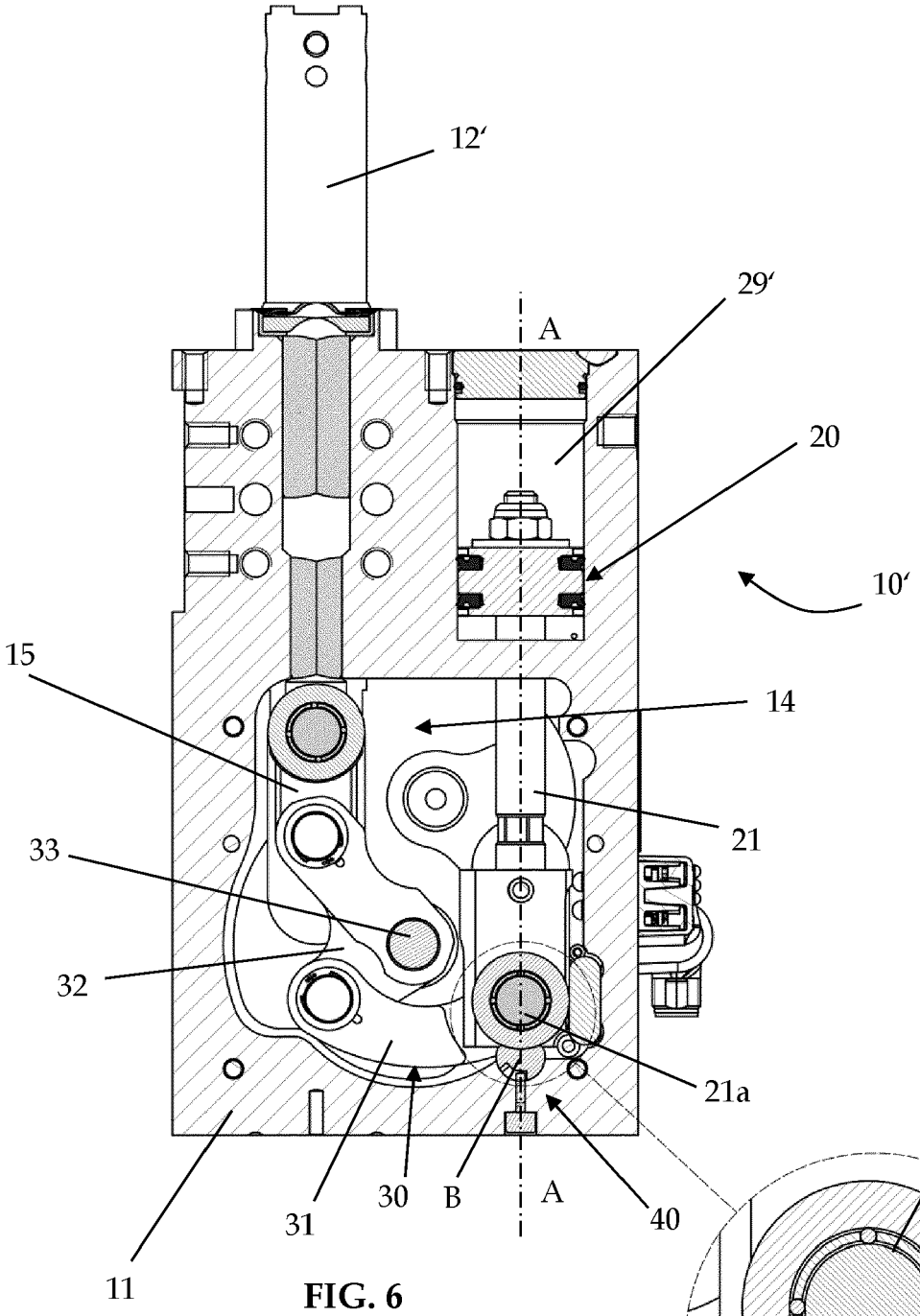

FIG. 6

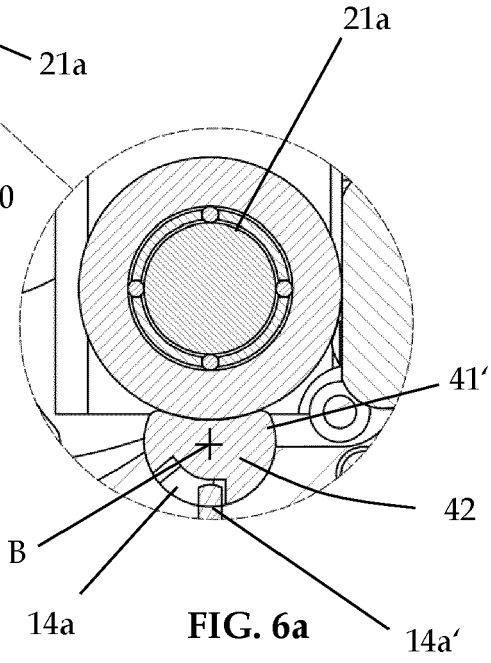

FIG. 6a

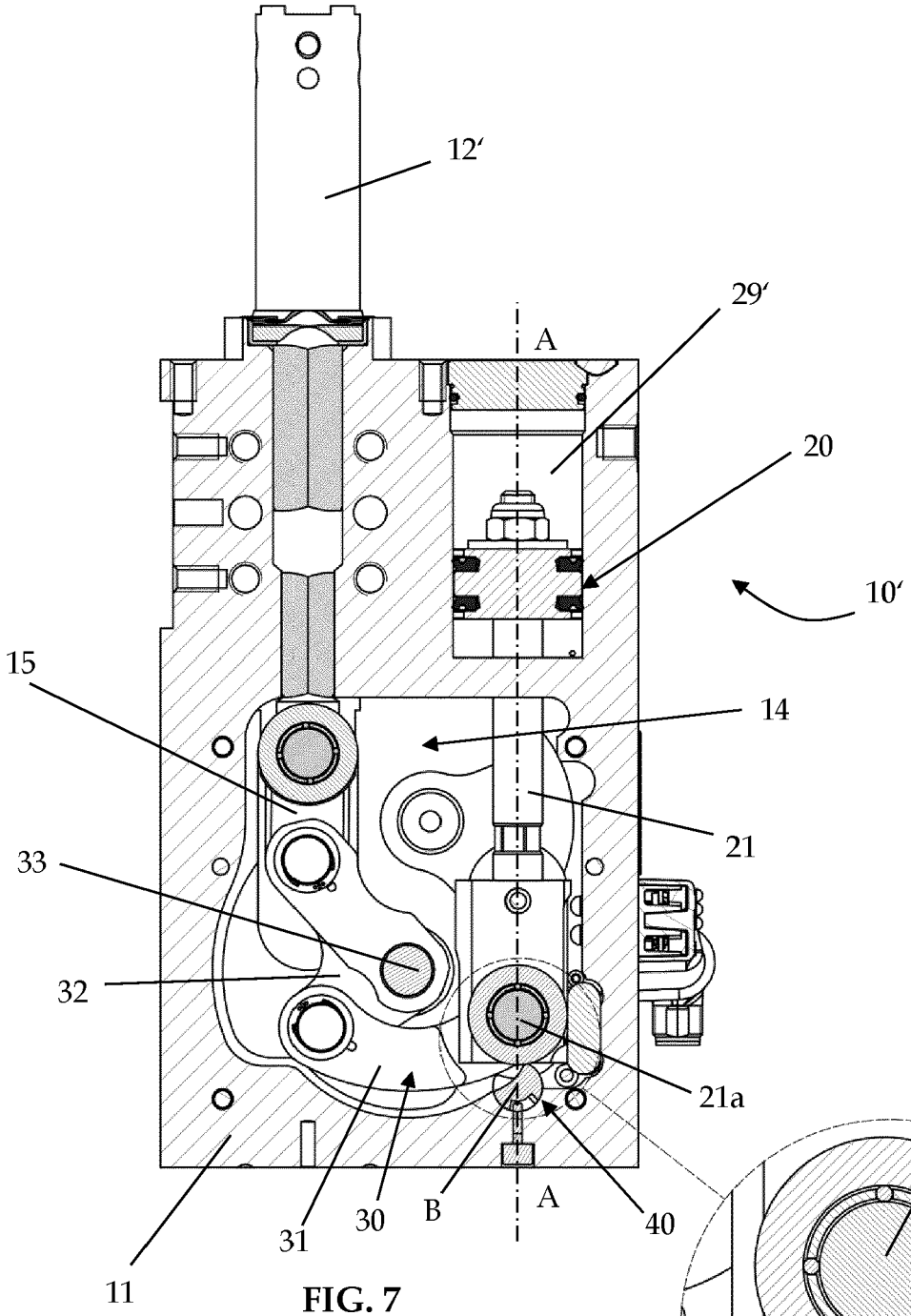

FIG. 7

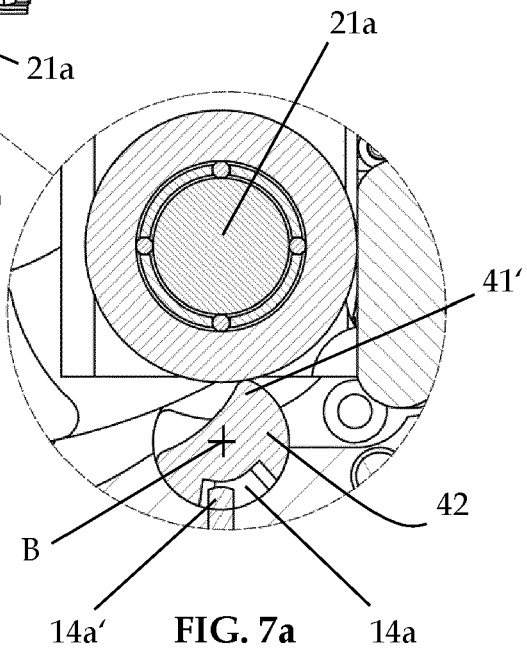

FIG. 7a

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EUROPEAN SEARCH REPORT

Application Number
EP 22 18 0959

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B25B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 November 2022	Pothmann, Johannes

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