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

(11) **EP 3 929 955 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.12.2021 Bulletin 2021/52

(51) Int Cl.:
H01H 33/12 *(2006.01)* ***H01H 33/666*** *(2006.01)*

(21) Application number: **21382562.3**

(22) Date of filing: **25.06.2021**

(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: **25.06.2020 ES 202030638**

(71) Applicant: **Ormazabal Corporate Technology, A.I.E.**
48340 Amorebieta-Etxano (Vizcaya) (ES)

(72) Inventors:
- **IZCARA ZURRO, Jesús**
  48340 AMOREBIETA-ETXANO (Vizcaya) (ES)
- **BARRIO RODRÍGUEZ, Sergio**
  48340 AMOREBIETA-ETXANO (Vizcaya) (ES)
- **ARANAGA LÓPEZ, Severo Jose**
  48340 AMOREBIETA-ETXANO (Vizcaya) (ES)
- **LARRIETA ZUBIA, Javier**
  48340 AMOREBIETA-ETXANO (Vizcaya) (ES)

(74) Representative: **Herrero & Asociados, S.L.**
Cedaceros, 1
28014 Madrid (ES)

(54) LOAD-BREAK OR SHORT-CIRCUIT CURRENT SWITCH

(57) It is a load-break or short-circuit current switch (1) comprising a main circuit (2) for the circulation of electric current and a secondary circuit (3) for the circulation of shunt electric current. The main circuit (2) comprises a switch-disconnector (4) with a fixed contact (5) and a moving contact (6), while the secondary circuit (3) comprises a vacuum switch (7) that is actuated by the moving contact (6) of the switch - disconnector (4), so that the load-break or short-circuit current switch (1) of the invention can execute at least three operating positions, making - breaking - disconnecting - grounding.

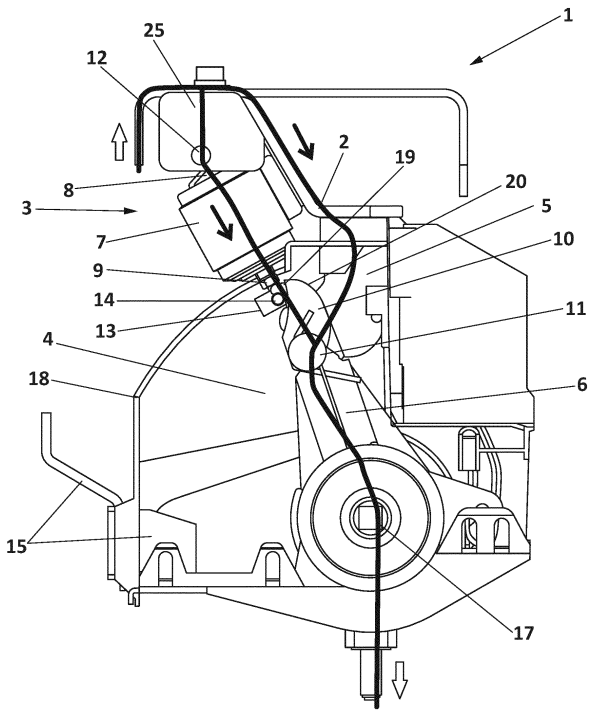

FIG. 4

EP 3 929 955 A1

Description

OBJECT OF THE INVENTION

[0001] The invention relates to a load-break or short-circuit current switch, for application in electric power distribution networks, comprising a main circuit for the circulation of electric current and a secondary circuit for the circulation of shunt electric current. The main circuit comprises a switch - disconnector with a fixed contact and a moving contact, while the secondary circuit comprises a vacuum switch that is actuated by the moving contact of the switch - disconnector.

[0002] The load-break or short-circuit current switch of the invention can adopt at least three operating positions, making - breaking - disconnecting, as well as a fourth grounding position, in the latter case comprising a grounding contact, thus having a compact load-break or short-circuit current switch capable of executing up to four operating positions.

BACKGROUND OF THE INVENTION

[0003] At present, the electrical switchgear used in electric power distribution networks is installed in enclosures that are usually metallic, called cells. Said switchgear comprises operating means that perform the functions of breaking - disconnecting - grounding of the installation.

[0004] On the one hand, operating means are used such as disconnectors that comprise two contacts that can be joined to allow the current to pass or leave a physical separation determined by the safety standard or the manufacturer to prevent the passage of current, and which also comprise a third contact for grounding the electrical circuit. But these disconnectors are sometimes not capable of performing the functions of the switch, that is, breaking the current when the circuit is on load or in the event of a fault due to overcurrent, if they have not been designed for it or do not have the appropriate extinguishing means.

[0005] It is known to use operating means based on SF6 gas contact separation technology in order to break the current (the current when the circuit is on load or fault current due to overcurrent). This solution has numerous advantages in terms of the compactness of the electrical switchgear, its cost and its performance, mainly due to the exceptional properties of SF6 gas, such as dielectric strength, thermal conductivity, chemical stability, etc. However, SF6 gas has the disadvantage of being part of the gases with a great environmental impact due to its high potential for greenhouse effect (GWP = 22800).

[0006] On the other hand, operating means constituted by vacuum switches are known, which consist of a bottle inside of which a pair of electrical contacts is housed, a fixed one and the other a moving one that moves by the actuation of an operating mechanism, to perform the breaking - making functions of the corresponding electrical circuit. But these vacuum switches are not used for current breaking functions when the circuit is on load due to their high cost.

[0007] In this sense, solutions are known in which a vacuum switch is placed in a secondary or shunt circuit in such a way as to guarantee the breaking of the electric current and at the same time reduce the cost of this technology because the vacuum switch used can be of lower performance by having to withstand the electric current for a shorter time. This secondary circuit is inactive in permanent regime and is only traversed by the electric current when the switch-disconnector arranged in a main circuit has begun its opening sequence, by means of a progressive transfer of electric current from the main circuit to the secondary circuit. As the vacuum switch is generally at rest, it does not have to be dimensioned based on the restrictive electrical and dielectric performance of the permanent regime, such as the short-circuit making capacity.

[0008] There are examples of the state of the art that deal with this type of solutions that comprise a main circuit equipped with a first operating means, such as a switch-disconnector, through which the electric current circulates in permanent regime and a secondary circuit equipped with a second operating means, such as a vacuum switch, through which the shunt electric current circulates, that is, in the switch-disconnector opening sequence, the moving contact of this last element intercepts, during its opening, a free end of the secondary circuit and the electric current begins to circulate through the secondary circuit at the same time as it circulates through the main circuit. In this way, following the opening sequence, the switch-disconnector is separated from the main circuit without producing any electric arc in the circuit. The continuation of the opening sequence and therefore the actuation of the moving contact of the switch-disconnector on the secondary circuit opens the vacuum switch, interrupting the electric current, extinguishing the electric arc and thus obtaining the breaking operating position. Subsequently, the moving contact of the switch-disconnector is separated from the free end of the secondary circuit and allows the vacuum switch to close its contacts, but without the passage of electric current, since the secondary circuit remains open. At this moment, the disconnecting operating position has been obtained. In case of having a grounding contact, the moving contact of the switch-disconnector would follow its opening sequence and by intercepting said moving contact the grounding contact would obtain the grounding position.

[0009] In this sense, some public documents that define this type of solutions can be cited, for example, ES2387862T3, ES2526220T3, ES2525080T3, DE102004006476B4 or WO2006074975A1.

[0010] In document ES2387862T3 the moving contact of the main circuit disconnector, in its opening sequence, intercepts / interacts with an actuating means arranged in the branch of the secondary circuit and which is asso-

ciated with the vacuum switch by means of a kinematic chain or movement transmission system to act on the moving contact of said vacuum switch and cause its opening. The actuating means is arranged at the free end of the branch of the secondary circuit, connected to it by means of an articulated area equipped with a stop that stops the movement of the actuating means in the opening direction of the disconnector and a spring that returns it to the stop position in the disconnector closure. The actuating means comprises a first face covered by a conductor directed towards the disconnector and a second face opposite the first one and covered by an insulator. The kinematic chain that transmits the movement to the moving contact of the vacuum switch comprises a plurality of elements, such as a moving part, a rod associated with the moving contact of the vacuum switch, a joint that allows articulation between the rod and the moving part, another fixed joint around which the moving part rotates, the articulated area that joins the actuating means with the branch of the secondary circuit, etc. This plurality of elements in the kinematic chain implies a greater space for its assembly, which makes the electrical switchgear itself occupy more space and be less compact. Likewise, having so many elements in the kinematic chain makes the transmission of movement more complex, which reduces its reliability, since all the elements must be well synchronized, and also makes its cost higher.

[0011] Similarly, ES2526220T3 has a means for actuating the moving contact of the vacuum switch in the branch of the secondary circuit, with the difference that in this solution the moving contact of the vacuum switch remains locked in its open position until the main circuit disconnector executes the closing sequence. The purpose of this blocking is to protect against a possible rapid reclosing of the secondary circuit. However, this blocking means that the vacuum switch is not ready for the next breaking operation and that the entire branch of the secondary circuit or shunt is not at the same electrical potential while the disconnector remains open. Likewise, in a similar way to the solution of ES2387862T3, the kinematic chain that transmits the movement to the moving contact of the vacuum switch comprises a plurality of elements, such as an actuating cam, springs, a lever (foldable if necessary), a engagement finger, projecting washers, off-center parts, etc., which implies a greater space for its mounting, which makes the electrical switchgear itself occupy more space and be less compact. As in the previous case, it involves the complication of the transmission of movement due to the need for synchronization of all the elements, as well as the economic inconvenience.

[0012] It is the object of document ES2525080T3 to simplify the kinematic chain to transmit the movement to the moving contact of the vacuum switch. In the solution of this document, the number of elements of the kinematic chain (referred to as "control mechanism" in the document) is reduced, which comprises a rotary rocker arm as a means of actuating the moving contact of the vacuum switch, which connects a rod that is associated with the moving contact of the vacuum switch with the moving contact of the main circuit. In this way, a unitary and flexibly mounted rocker arm replaces a control mechanism made up of parts articulated with each other. As in the previous cases, the means for actuating the moving contact of the vacuum switch, specifically the rocker arm, is part of the branch of the secondary circuit, being the electrical conduction through the branch of the secondary circuit provided by the rocker arm or possibly by a conductive switching lug, electrically connected to the moving contact of the vacuum switch and extending to a free end superimposed approximately on a free end of the rocker arm that intercepts the moving contact of the main circuit, wherein this moving contact of the main circuit frictions over the free end of the switching lug.

[0013] DE102004006476B4 also defines a means for actuating the moving contact of the vacuum switch that is part of the branch of the secondary circuit, comprising in said secondary circuit the complete kinematic chain for the transmission of movement to the moving contact of the vacuum switch.

[0014] On the contrary, in document WO2006074975A1 the actuating means is part of the main circuit, since in this case the actuating means is a cam disc that is electrically and mechanically connected to the moving contact of the main circuit. In this solution, the moving contact of the vacuum switch comprises at its free end an electrically conductive pin element and this pin is intercepted by the cam disc in the opening sequence of the main circuit. In this sense, the cam disc comprises a guide slot into which the pin element is inserted and as the main circuit follows its opening sequence, the pin is forced to go through said guide slot, the pin in turn transmitting said movement to the moving contact of the vacuum switch. The electrical current shunts through the pin element and the cam disc. In the closing sequence of the main circuit, the cam disc does not interfere with the pin element, so the vacuum switch is not subjected to any action and remains with its contacts closed. This solution involves the drawback that the guide slot of the cam disc has to have a path that is synchronized with the movement path of the moving contact of the main circuit, so that as said moving contact of the main circuit moves, the pin element is located at the appropriate point in the guide slot to convert the angular displacement of the moving contact of the main circuit into linear displacement that the pin element must transmit to the moving contact of the vacuum switch. Also, the vacuum switch is fixed, that is, the vacuum switch does not comprise any movement, so the guide slot must be more precisely traced.

[0015] Regarding the arrangement of the vacuum switch in a fixed, static way, this feature, which is also fulfilled in the examples of the state of the art mentioned above, entails another drawback, the one referring to the absorption of the shock when the actuating means or the

same moving contact of the main circuit intercepts the moving contact of the vacuum switch or, in the case of the last example, the pin element, since the vacuum switch and its connections on the secondary circuit do not include any damping means against said shock of the interception moment.

DESCRIPTION OF THE INVENTION

[0016] The load-break or short-circuit current switch object of the present invention is applicable in electrical power distribution facilities such as, for example, electrical transformation centers, distribution centers, substations, etc., for the protection and operation of electrical circuits, and solves each and every one of the problems mentioned above.

[0017] Specifically, said load-break or short-circuit current switch can be incorporated into an enclosure, this enclosure being able to be watertight, and insulated in any dielectric gas such as air, dry air, N_2, O_2, CO_2, or gas mixtures such as, for example, fluoroketones with vector gases such as CO_2, N_2, O_2, air or mixtures thereof, or gas mixtures such as hydrofluoroolefins with vector gases such as N_2, O_2, dry air, helium, CO_2 or mixtures thereof, or sulfur hexafluoride, etc.

[0018] The enclosure may comprise at least one electrical connection means, such as a male or female type bushing, and at least one mechanical connection means accessible both from the inside and from the outside, so that the coupling of other elements with the enclosure is facilitated, such as a operating mechanism by means of mechanical connection means or other electrical switchgear by means of electrical connection. The load-break or short-circuit current switch of the invention is installed inside said enclosure and therefore insulated in the same gas that contains the enclosure.

[0019] The load-break or short-circuit current switch comprises a main circuit for the circulation of the electric current and a secondary circuit for the circulation of the shunt electric current. The main circuit comprises at least one first operating means, such as a switch-disconnector equipped with a fixed contact and a moving contact, while the secondary circuit comprises at least one second operating means, such as a vacuum switch comprising inside a fixed contact and a moving contact.

[0020] The load-break or short-circuit current switch can adopt at least three operating positions, making - breaking - disconnecting - grounding, so that the switch-disconnector can also comprise a grounding contact. In this way, the vacuum switch arranged in the secondary circuit performs the breaking operation and the switch-disconnector of the main circuit performs the making, disconnecting and grounding operations, thus compactly providing a load-break or short-circuit current switch capable of executing up to four operating positions.

[0021] In this sense, in the switch-disconnector opening sequence, the moving contact of this last element intercepts in the course of its opening stroke a free end of the secondary circuit and the electric current begins to circulate through the secondary circuit at the same time that it circulates through the main circuit. At the free end of the secondary circuit is the vacuum switch, so the vacuum switch is actuated by the movement of the moving contact of the switch - disconnector In this state in which the electric current circulates both through the main circuit and through the secondary circuit, following the opening sequence, the moving contact of the switch-disconnector is separated from the main circuit without producing any electric arc in the circuit.

[0022] Following the opening sequence, the moving contact of the switch-disconnector acts on the vacuum switch, interrupting the electric current, extinguishing the electric arc and thus obtaining the breaking operating position. The moving contact of the switch-disconnector of the main circuit comprises an actuating means that moves integral with said moving contact of the switch-disconnector, said actuating means being connected to the moving contact by means of a first articulation element, such as a return spring, so that the actuating means is the one that acts directly on the vacuum switch in the opening sequence of the load-break or short-circuit current switch. By acting directly on the vacuum switch, it is understood that the same actuating means constituted by a single element separates the vacuum switch contacts, thereby simplifying the kinematic chain, implying less space for its assembly, which makes the electrical switchgear itself occupy less space and be more compact. Also, having fewer elements in the kinematic chain makes the transmission of movement easier, which increases its reliability and also makes its cost more inexpensive The fixed contact of the vacuum switch is connected to a fixed part of the secondary circuit by means of a second articulation element, such as for example a return spring, leaving the moving contact of the vacuum switch free to be actuated by the actuating means in the opening sequence of the load-break or short-circuit current switch. For this purpose, the moving contact of the vacuum switch comprises a stop means with which it mechanically and electrically connects the actuating means in the opening sequence of the load-break or short-circuit current switch. The stop means can comprise at least one bolt, for example, in the form of a latch like the one presented by door locks, so that in an opening sequence of the load-break or short-circuit current switch the actuating means engages said bolt and pulls it until it is released when the vacuum switch reaches its breaking operating position. In the opening sequence, the actuating means engages the bolt on the side that is not curved, which means that said bolt does not retract, and the actuating means is released due to its tilting in the first articulation element, which is when the vacuum switch reaches its breaking operating position.

[0023] The fixed contact of the vacuum switch is connected to the fixed part of the secondary circuit by means of the second articulation element, so that the vacuum switch comprises a movement around said second artic-

ulation element, such as a pendulum movement. Due to this movement of the vacuum switch, said vacuum switch, and also its junctions on the secondary circuit do not suffer any dry impact when the actuating means intercepts the moving contact of the vacuum switch, the same movement dampens or absorbs a large part of the impact.

[0024] Once the breaking operating position has been obtained, the actuating means that is connected to the moving contact of the switch-disconnector is separated from the free end of the secondary circuit, that is, from the stop means of the moving contact of the vacuum switch and allows the vacuum switch to close its contacts, but without the passage of electric current since the secondary circuit remains open, and to return to its initial position by virtue of the action of the second articulation element. At this moment, the disconnecting operating position has been obtained. From this point on, the moving contact of the switch-disconnector would follow its opening sequence and by intercepting said moving contact the grounding contact would obtain the grounding position.

[0025] The actuating means comprises a first electrically conductive face and a second electrically insulating or insulated face opposite the first face, so that in the opening sequence of the load-break or short-circuit current switch the electrical conductive face is that which mechanically and electrically connects with the stop means of the moving contact of the vacuum switch.

[0026] In the closing sequence of the load-break or short-circuit current switch, the actuating means does not interfere electrically or mechanically with the vacuum switch, and therefore it does not interfere with the secondary circuit, because the actuating means comprises the second electrically insulating or isolated face and due to the fact that in the closing sequence the bolt of the stop means of the moving contact of the vacuum switch retracts allowing the actuating means to pass or the actuating means itself retracts and does not interfere with the stop means.

[0027] The switch-disconnector comprises an actuating shaft that acts on its moving contact to execute both the opening sequence and the closing sequence of the load-break or short-circuit current switch.

[0028] The possibility has been contemplated that the load-break or short-circuit current switch may comprise a housing, wherein at least partially some of its elements are integrated, such as the moving contact of the switch-disconnector, the actuating means, the grounding contact of the switch-disconnector, etc.

[0029] Finally, the load-break or short-circuit current switch can comprise a three-phase configuration and comprise part of its elements corresponding to the three phases, at least partially, incorporated inside the housing.

DESCRIPTION OF THE FIGURES

[0030] To complement the description and in order to help a better understanding of the features of the invention, according to a preferred example of a practical embodiment thereof, a set of figures is attached as an integral part of said description in which, for illustrative and non-limiting purposes, the following has been represented:

Figure 1.- Shows a perspective view of the enclosure that incorporates inside the load-break or short-circuit current switch of the invention, wherein at least one electrical connection means and one mechanical connection means have been represented accessible from the outside of said enclosure.

Figure 2.- Shows an elevation view of the load-break or short-circuit current switch of the invention.

Figure 3.- Shows a sectioned elevation view of the load-break or short-circuit current switch in its making operating position (the main electrical circuit is closed), wherein the electrical current circulates only through the main circuit.

Figure 4.- Shows a sectioned elevation view of the load-break or short-circuit current switch once the opening sequence has begun, wherein the electric current circulates through both the main circuit and the secondary circuit.

Figure 5.- Shows a sectioned elevation view of the load-break or short-circuit current switch following the opening sequence, wherein the electric current only circulates through the shunt secondary circuit.

Figure 6.- Shows a sectioned elevation view of the load-break or short-circuit current switch following the opening sequence, in its breaking operating position.

Figure 7.- Shows a sectioned elevation view of the load-break or short-circuit current switch following the opening sequence, in its disconnecting operating position.

Figure 8.- Shows a sectioned elevation view of the load-break or short-circuit current switch, in its grounding operating position.

Figure 9.- Shows a detail of the stop means of the moving contact of the vacuum switch according to a first possible embodiment.

Figure 10.- Shows a detail of the stop means of the moving contact of the vacuum switch according to a second possible embodiment.

PREFERRED EMBODIMENT OF THE INVENTION

[0031] Figure 1 shows an enclosure (22) inside which the load-break or short-circuit current switch (1) object of the present invention is installed, this enclosure (22) being able to be watertight, and insulated in any dielectric gas such as air, dry air, N_2, O_2, CO_2, or gas mixtures such as, for example, fluoroketones with vector gases such as CO_2, N_2, O_2, air or mixtures thereof, or gas mixtures such as, for example, hydrofluoroolefins with vector gases such as N_2, O_2, dry air, helium, CO_2 or mixtures thereof, or sulfur hexafluoride, etc.

[0032] The enclosure (22) comprises at least one electrical connection means (23), such as a male or female type bushing, and at least one mechanical connection means (24) accessible both from inside the enclosure (22) as well as from its outside, so that the coupling of other elements with the enclosure (22) is facilitated, such as a operating mechanism by means of mechanical connection means (24) or other electrical switchgear by means of electrical connection (23). The load-break or short-circuit current switch (1) of the invention is installed inside said enclosure (22) and therefore isolated in the same gas that contains the enclosure (22).

[0033] As shown in figures 2-8, the load-break or short-circuit current switch (1) comprises a main circuit (2) for the circulation of the electric current and a secondary circuit (3) for the circulation of the shunt electric current. The main circuit (2) comprises at least a first operating means, such as a switch-disconnector (4), provided with a fixed contact (5) and a moving contact (6), while the secondary circuit (3) comprises at least one second operating means (7), such as a vacuum switch, which comprises inside a fixed contact (8) and a moving contact (9). The load-break or short-circuit current switch (1) can adopt at least three operating positions, making - breaking - disconnecting - grounding, so that the switch - disconnector (4) can also comprise a grounding contact (15). In this way, the vacuum switch (7) arranged in the secondary circuit (3) performs the breaking operation, as shown in figure 6, while the switch-disconnector (4) of the main circuit (2) performs the making, disconnecting and grounding operations, as shown in figures 3, 7 and 8 respectively.

[0034] Starting from the making operating position of the load-break or short-circuit current switch (1) represented in figure 3, in the opening sequence, the moving contact (6) of the switch-disconnector (4) intercepts, in the course of its opening stroke, a free end of the secondary circuit (3) and the electric current begins to circulate through the secondary circuit (3) while it circulates through the main circuit (2), as shown in the figure 4. At the free end of the secondary circuit (3) is the vacuum switch (7), so the vacuum switch (7) is actuated by the movement of the moving contact (6) of the switch-disconnector (4).

[0035] From this state in which the electric current circulates both through the main circuit (2) and through the secondary circuit (3), following the opening sequence, the moving contact (6) of the switch-disconnector (4) is separated from the fixed contact (5) and therefore from the main circuit (2) without producing any electric arc in the circuit, as shown in figure 5, now circulating the electric current only through the secondary circuit (3).

[0036] As shown in Figures 3-8, the moving contact (6) of the switch-disconnector (4) of the main circuit (2) comprises an actuating means (10) that moves integral with said moving contact (6) of the switch-disconnector (4), said actuating means (10) being connected to the moving contact (6) by means of a first articulation element (11), such as a return spring, such that the actuating means (10) is the one that acts directly on the vacuum switch (7) in the opening sequence of the load-break or short-circuit current switch (1).

[0037] The fixed contact (8) of the vacuum switch (7) is connected to a fixed part (25) of the secondary circuit (3) by means of a second articulation element (12), such as a return spring, so that the vacuum switch (7) containing the contacts (8, 9) comprises a movement around said second articulation element (12), such as for example a pendulum movement. The moving contact (9) of the vacuum switch (7) is free to be actuated by the actuating means (10) in the opening sequence of the load-break or short-circuit current switch (1). For this purpose, as shown in Figures 3-10, the moving contact (9) of the vacuum switch (7) comprises a stop means (13) with which it mechanically and electrically connects the actuating means (10) in the opening sequence of the load-break or short-circuit current switch (1). The stop means (13) can comprise at least one bolt (14), for example in the form of a latch such as that presented by door locks, as shown in Figure 9, so that in an opening sequence of the load-break or short-circuit current switch (1) the actuating means (10) engages said bolt (14) and pulls it until it is released when the vacuum switch (7) reaches its breaking operating position, represented in figure 6. In the opening sequence the actuating means (10) engages the bolt (14) on the side that is not curved, which means that said bolt (14) does not retract, and the actuating means (10) is released due to its tilting in the first articulation element (11), which is when the vacuum switch (7) reaches its breaking operating position represented in figure 6.

[0038] The possibility that the stop means (13) may comprise at least one bolt (14) connected to a different element of the stop means (13) by means of a mechanism (16) has also been considered, as shown in the Figure 10, so that in an opening sequence of the load-break or short-circuit current switch (1) the actuating means (10) engages said bolt (14) and this bolt (14) retracts once the breaking position of the vacuum switch (7) is reached.

[0039] Once the breaking operating position has been obtained, as shown in figure 6, the actuating means (10) that is connected to the moving contact (6) of the switch-disconnector (4) is separated from the free end of the secondary circuit (3), that is, of the stop means (13) of

the moving contact (9) of the vacuum switch (7), and allows the vacuum switch (7) to close its contacts (8, 9), but without passage of electric current since the secondary circuit (3) remains open, and to return to its initial position by virtue of the action of the second articulation element (12).

[0040] At this moment the load-break or short-circuit current switch (1) is in the disconnecting operating position, as shown in figure 7. From this point, the moving contact (6) of the switch-disconnector (4) can follow its opening sequence and by intercepting said moving contact (6) the grounding contact (15) the grounding position is obtained, as shown in figure 8.

[0041] As shown in Figures 3-8, the actuating means (10) comprises a first electrically conductive face (19) and a second electrically insulating or insulated face (20) opposite the first face (19), so that in the opening sequence of the load-break or short-circuit current switch (1) the first electrically conductive face (19) is the one that mechanically and electrically connects with the stop means (13) of the moving contact (9) of the vacuum switch (7), so that said moving contact (9) is mechanically actuated while allowing the electrical conduction of the current through the secondary circuit (3).

[0042] In the closing sequence of the load-break or short-circuit current switch (1), the actuating means (10) does not interfere electrically or mechanically with the vacuum switch (7), and therefore neither with the secondary circuit (3), because the actuating means (10) comprises the second face (20) being electrically insulating or isolated and because in the closing sequence the bolt (14) of the stop means (13) of the moving contact (9) of the vacuum switch (7) retracts allowing the actuating means (10) to pass or the actuating means (10) itself retracts and does not interfere with the stop means (13).

[0043] The switch-disconnector (4) comprises an actuating shaft (17), as shown in Figures 2-8, which acts on the moving contact (6) to execute both the opening sequence and the closing sequence of the load-break or short-circuit current switch (1) due to the action of a operating mechanism not represented in the figures and which can be coupled to the enclosure (22) through the mechanical connection means (24) represented in figure 1.

[0044] The possibility has been considered that the load-break or short-circuit current switch (1) may comprise a housing (18), as shown in Figures 2-8, wherein at least partially some of its elements are integrated, such as the moving contact (6) of the switch-disconnector (4), the actuating means (10), the grounding contact (15) of the switch-disconnector (4), etc.

[0045] Finally, the load-break or short-circuit current switch (1) can comprise a three-phase configuration and therefore comprise part of its elements corresponding to the three phases, at least partially, incorporated inside the housing (18).

Claims

1. Load-break or short-circuit current switch (1) comprising a main circuit (2) for the circulation of the electric current and a secondary circuit (3) for the circulation of the shunt electric current, wherein the main circuit (2) comprises a switch-disconnector (4) provided with a fixed contact (5) and a moving contact (6), and wherein the secondary circuit (3) comprises a vacuum switch (7) which in turn comprises a fixed contact (8) and a moving contact (9), the vacuum switch (7) being activated by the movement of the moving contact (6) of the switch - disconnector (4), **characterized in that** the moving contact (6) of the switch-disconnector (4) of the main circuit (2) comprises an actuating means (10) that moves integral with said moving contact (6) of the switch-disconnector (4), said actuating means (10) being connected to the moving contact (6) of the switch-disconnector (4) by means of a first articulation element (11), so that the actuating means (10) acts on the vacuum switch (7) in the opening sequence of the load-break or short-circuit current switch (1), and **in that** the vacuum switch (7) is connected to a fixed part (25) of the secondary circuit (3) by means of a second articulation element (12), so that the vacuum switch (7) comprises a movement around said second articulation element (12).

2. Load-break or short-circuit current switch (1) according to claim 1, **characterized in that** the movement of the vacuum switch (7) around the second articulation element (12) is a pendulum movement.

3. Load-break or short-circuit current switch (1) according to claim 1 o 2, **characterized in that** it comprises at least three operating positions, making - breaking - disconnecting - grounding, so that the switch - disconnector (4) comprises a grounding contact (15).

4. Load-break or short-circuit current switch (1) according to any of the preceding claims, **characterized in that** the fixed contact (8) of the vacuum switch (7) is connected to the fixed part (25) of the secondary circuit (3) by means of the second articulation element (12), leaving the moving contact (9) of the vacuum switch (7) free to be actuated by the actuating means (10) in the opening sequence of the load-break or short-circuit current switch (1).

5. Load-break or short-circuit current switch (1) according to claim 4, **characterized in that** the moving contact (9) of the vacuum switch (7) comprises a stop means (13) with which it mechanically and electrically connects the actuating means (10) in the opening sequence of the load-break or short-circuit current switch (1).

6. Load-break or short-circuit current switch (1) according to claim 5, **characterized in that** the stop means (13) comprises at least one bolt (14) in the form of a latch, so that in an opening sequence of the load-break or short-circuit current switch (1) the actuating means (10) engages said bolt (14) and pulls it until it is released when the vacuum switch (7) reaches its breaking operating position, while in a closing sequence of the load-break or short-circuit current switch (1) the bolt (14) is retracted allowing the actuating means (10) to pass.

7. Load-break or short-circuit current switch (1) according to claim 5, **characterized in that** the stop means (13) comprises at least one bolt (14) connected to a different element from the stop means (13) by means of a mechanism (16), so that in an opening sequence of the load-break or short-circuit current switch (1) the actuating means (10) engages said bolt (14) and this bolt (14) retracts once the breaking position of the vacuum switch (7) is reached, while in a closing sequence of the load-break or short-circuit current switch (1) the actuating means (10) retracts and does not interfere with the stop means (13).

8. Load-break or short-circuit current switch (1) according to any of the preceding claims, **characterized in that** the actuating means (10) comprises a first electrically conductive face (19) and a second electrically insulating or insulated face (20) opposite the first face (19).

9. Load-break or short-circuit current switch (1) according to any of the preceding claims, **characterized in that** the first articulation element (11) and the second articulation element (12) comprise return springs.

10. Load-break or short-circuit current switch (1) according to any of the preceding claims, **characterized in that** the switch-disconnector (4) comprises an actuating shaft (17) that acts on the moving contact (6) of the switch-disconnector (4).

11. Load-break or short-circuit current switch (1) according to any of the preceding claims, **characterized in that** it comprises a housing (18).

12. Load-break or short-circuit current switch (1) according to any of the preceding claims, **characterized in that** it comprises a three-phase configuration.

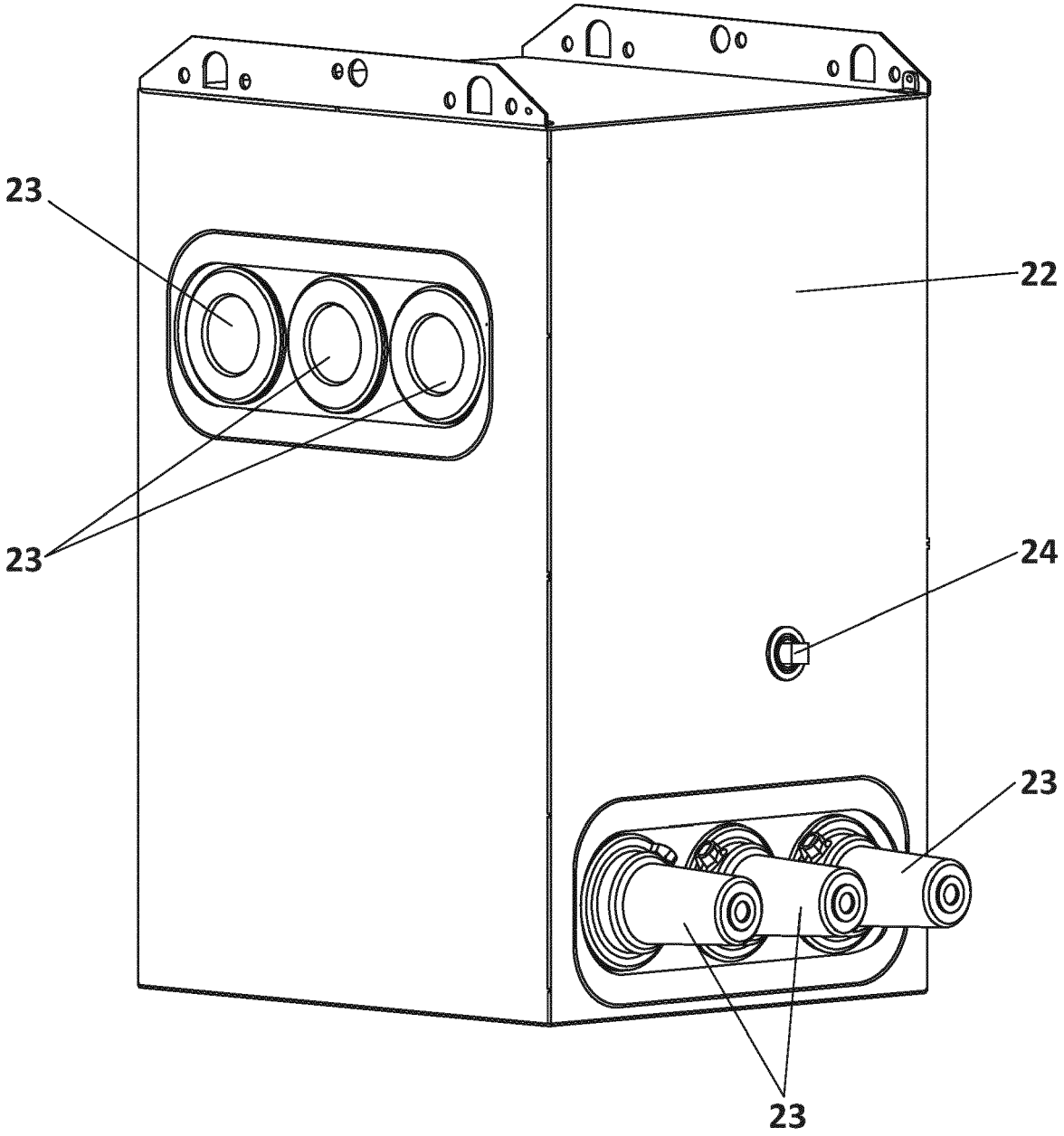

FIG. 1

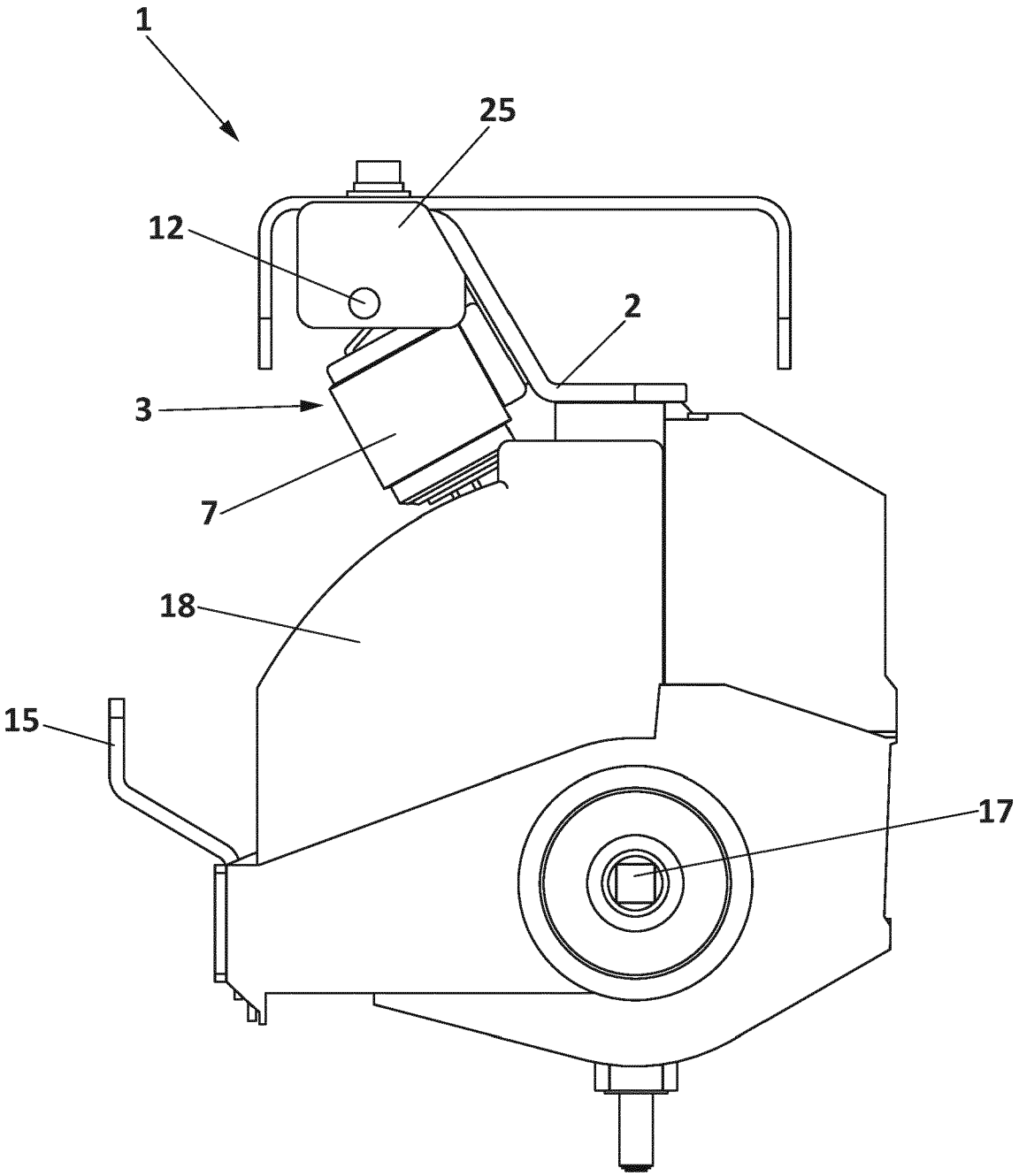

FIG. 2

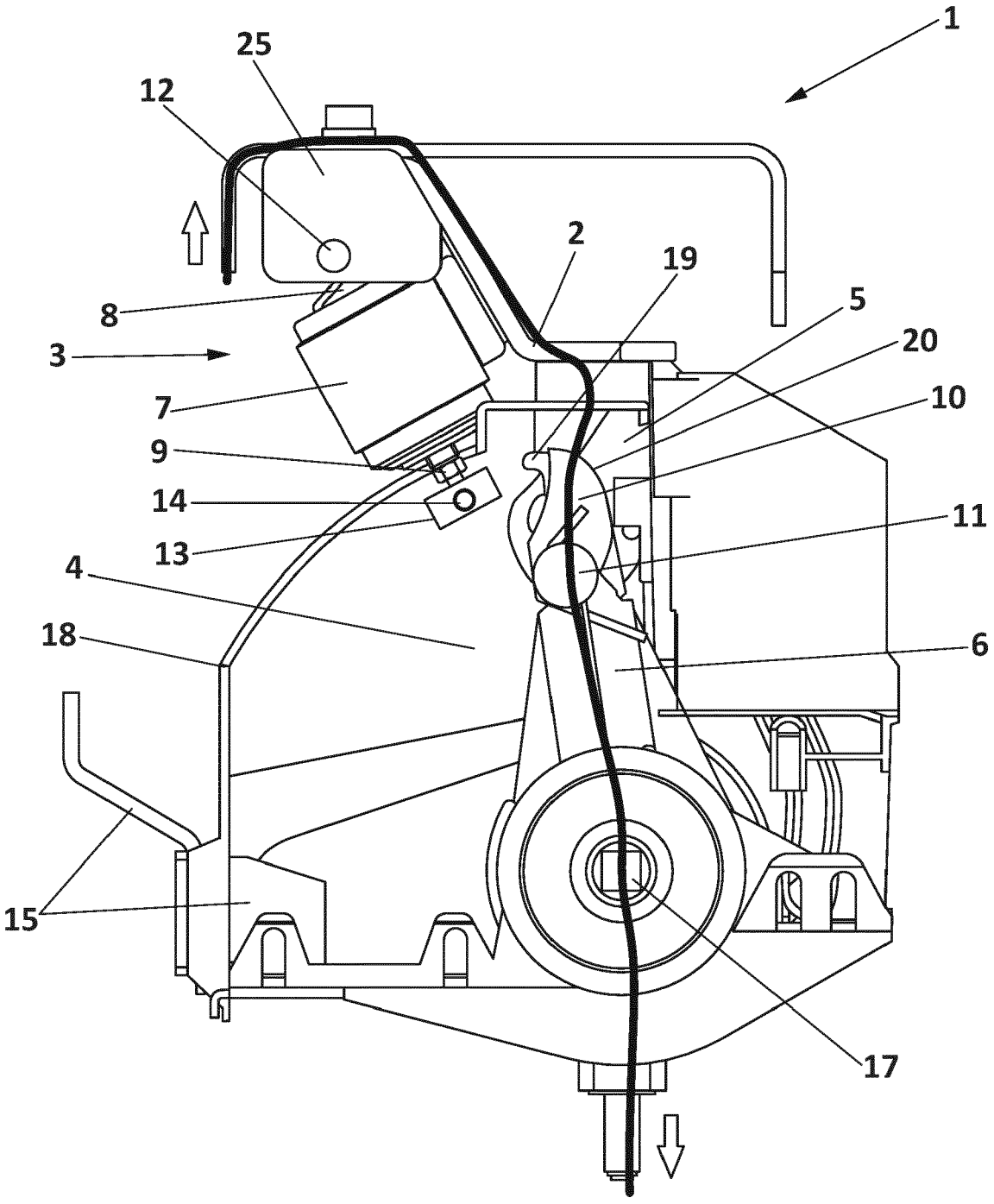

FIG. 3

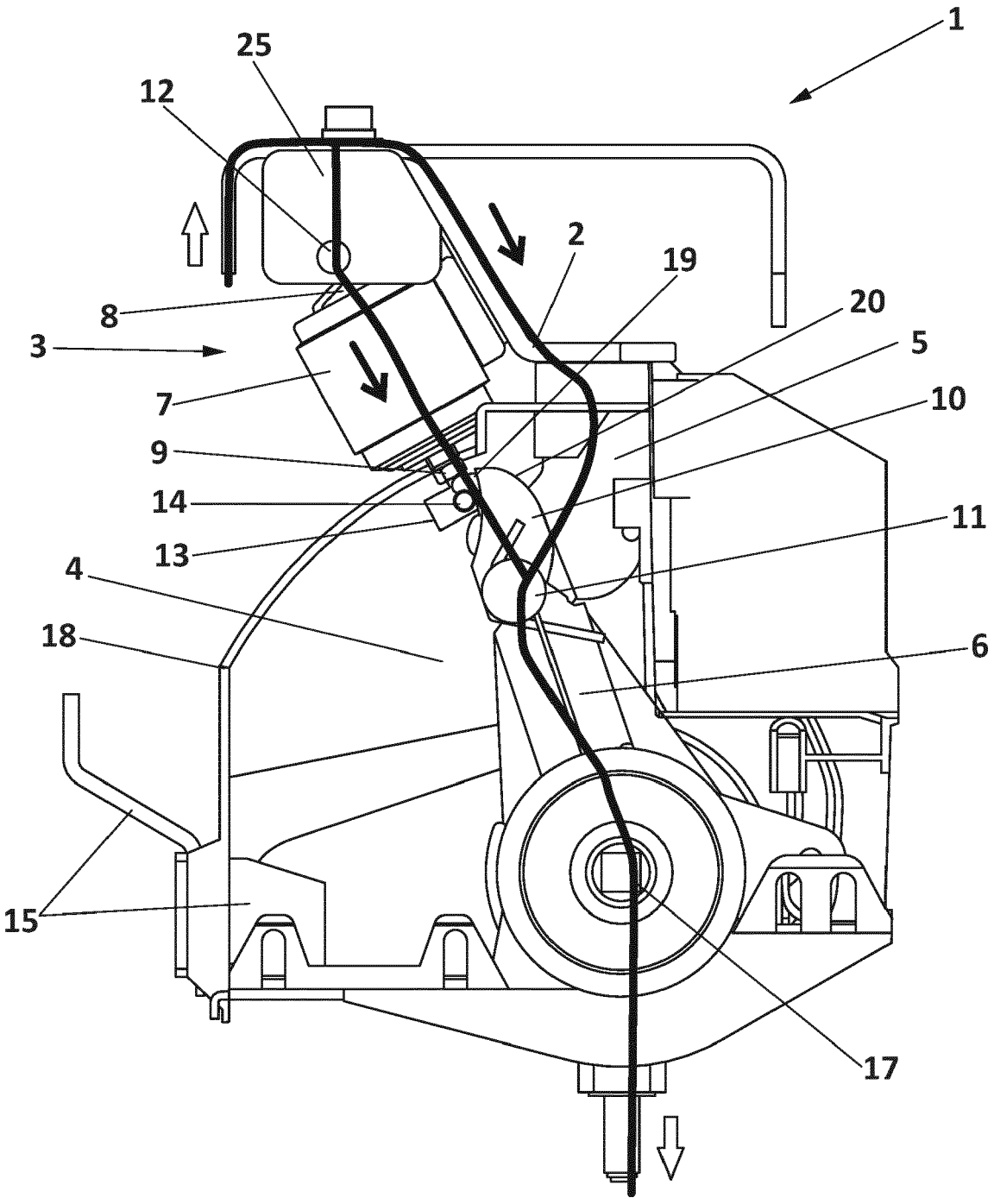

FIG. 4

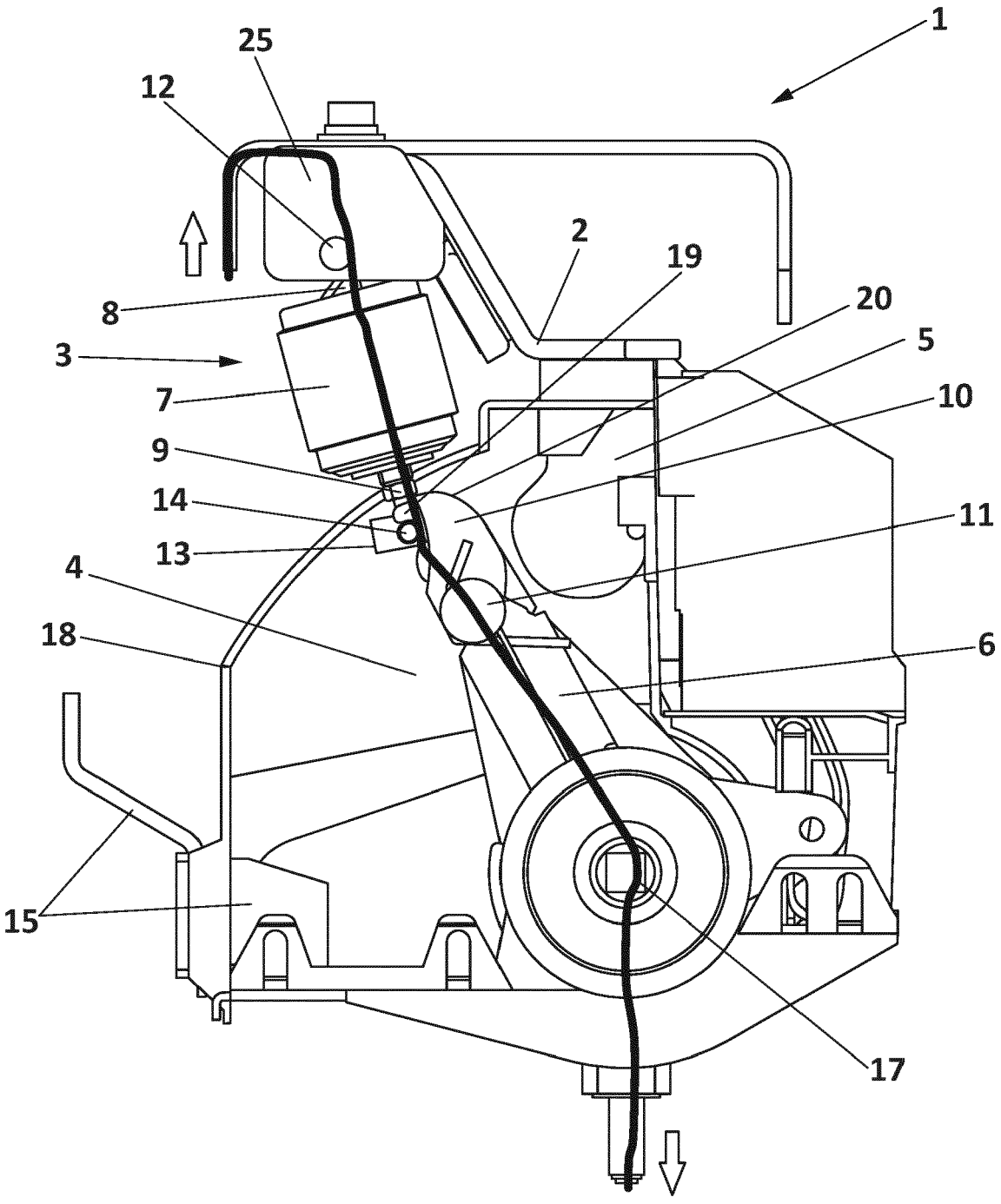

FIG. 5

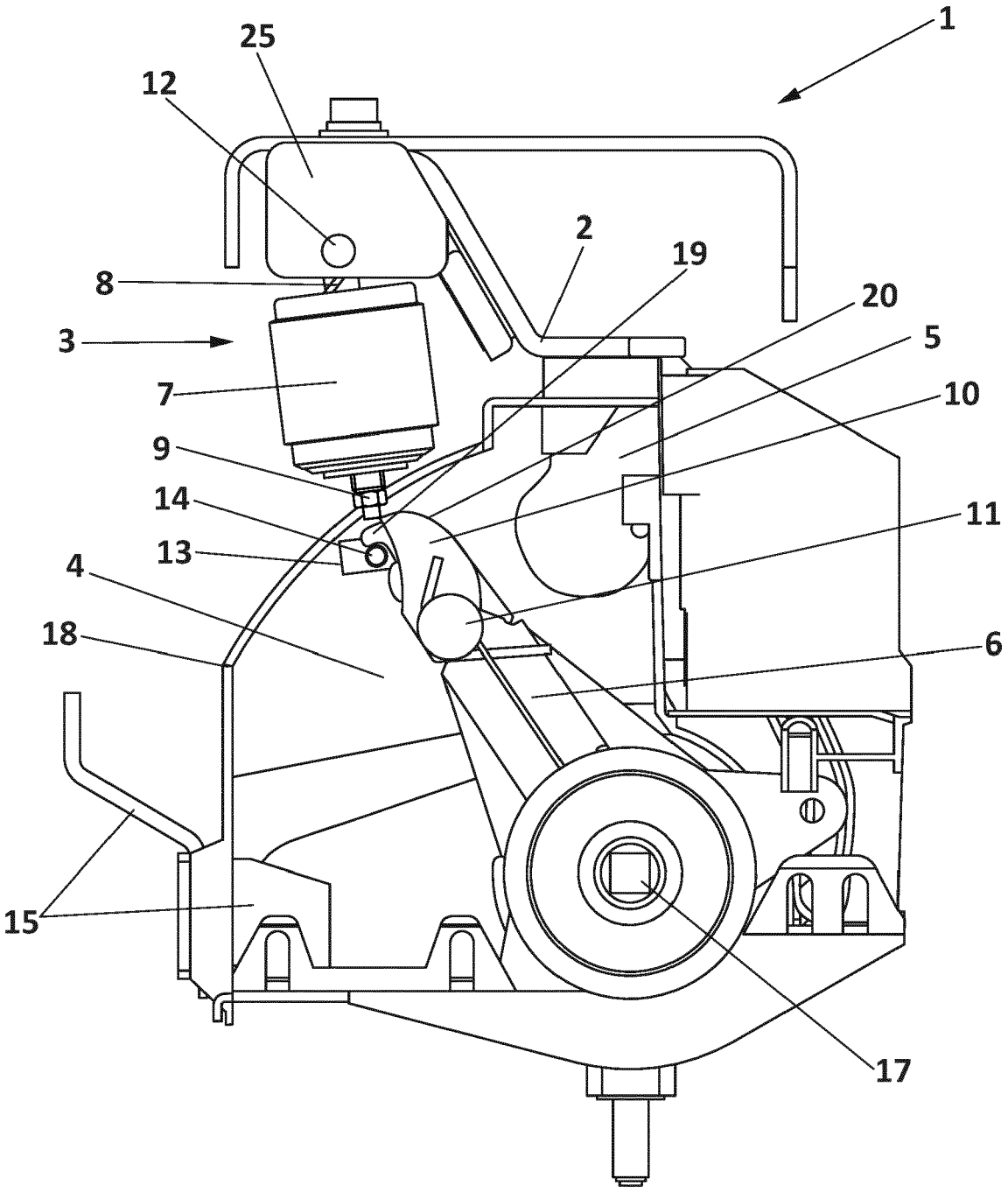

FIG. 6

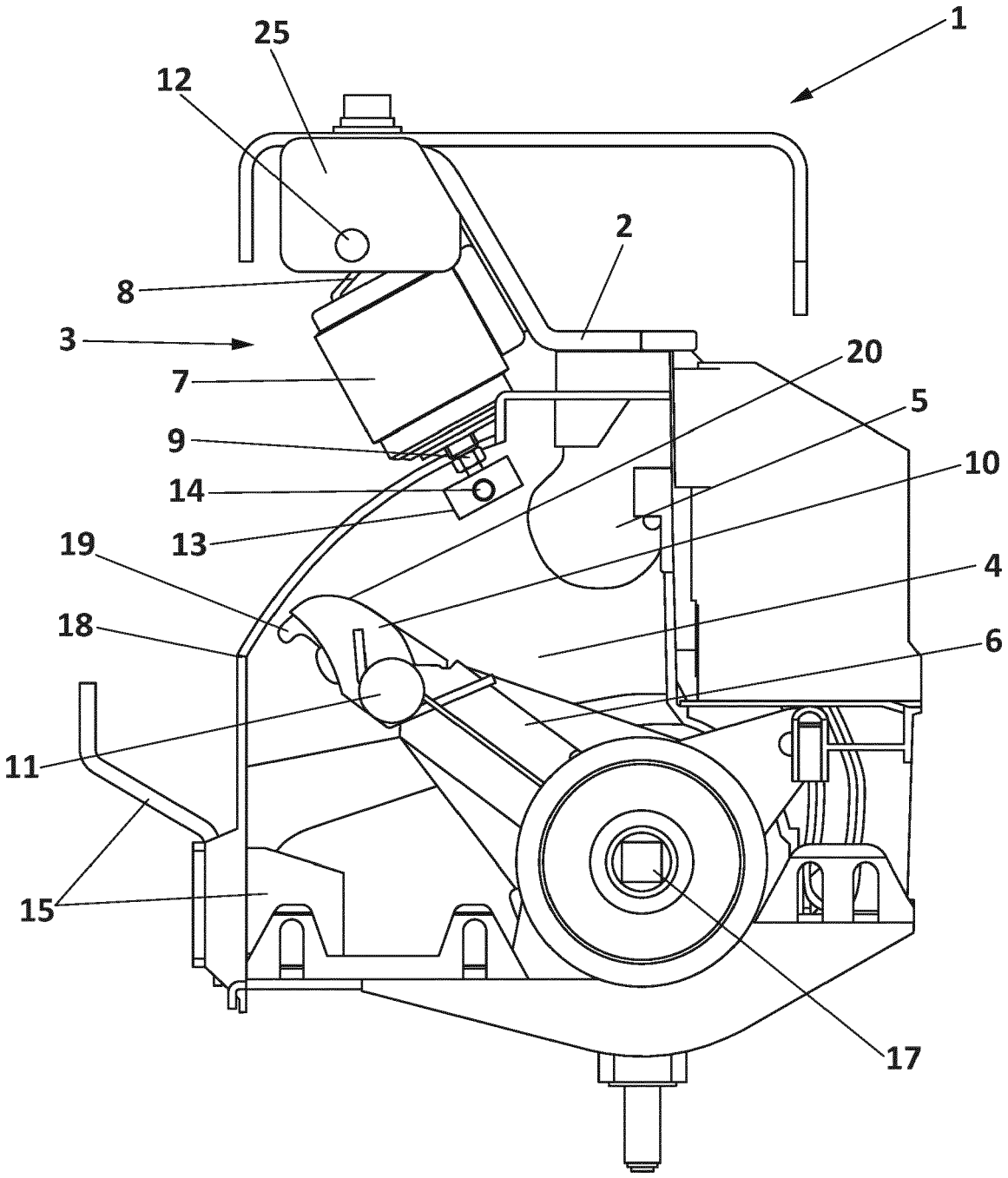

FIG. 7

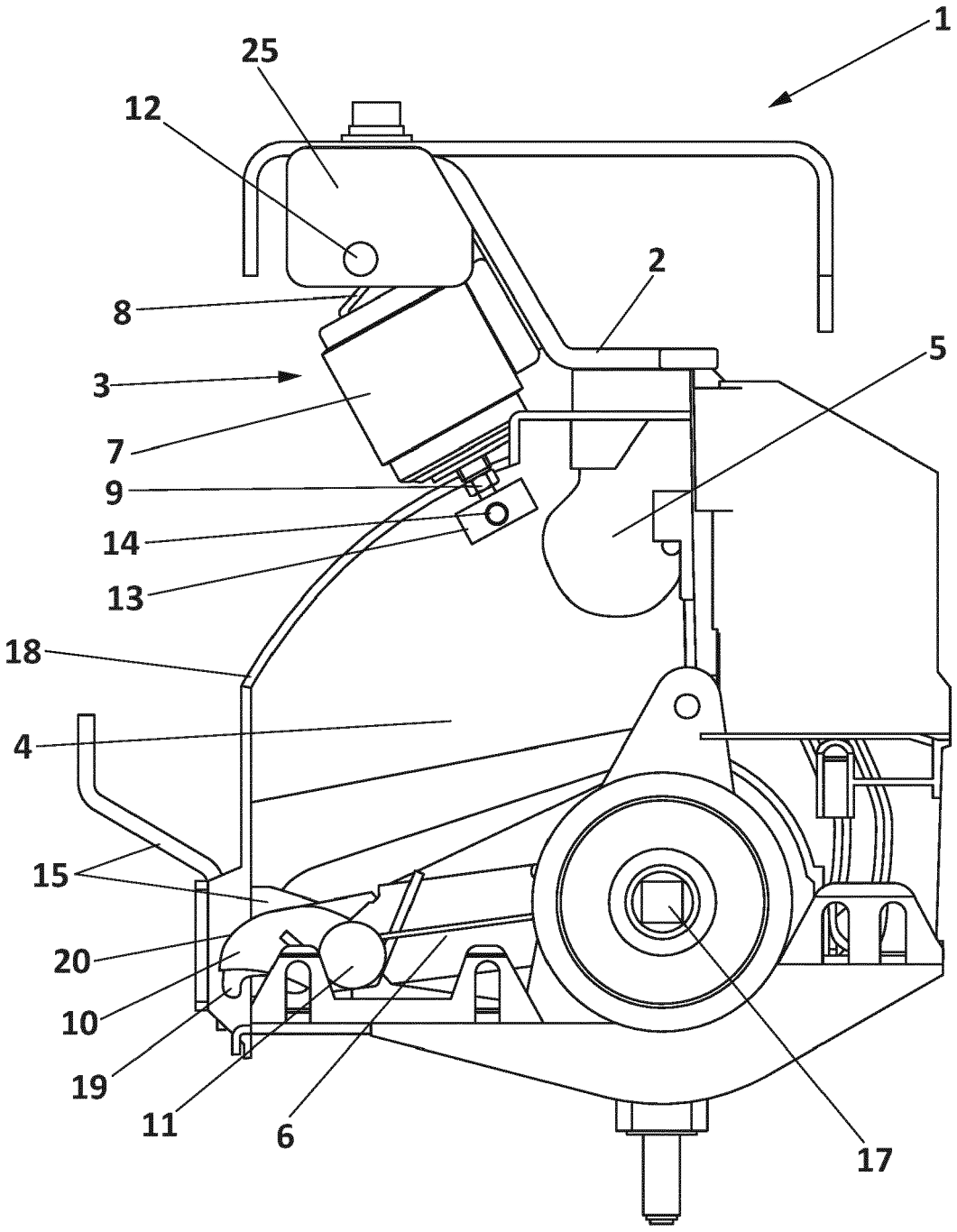

FIG. 8

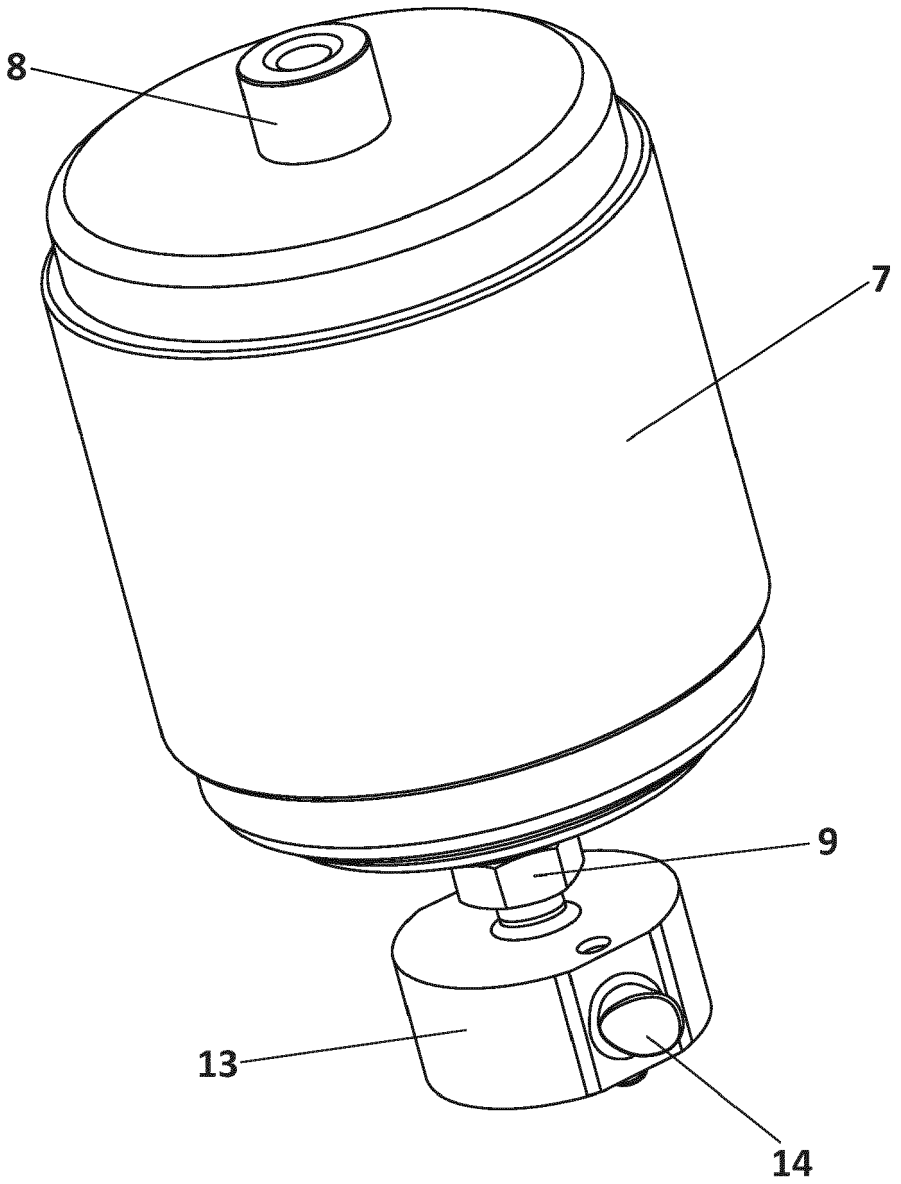

FIG. 9

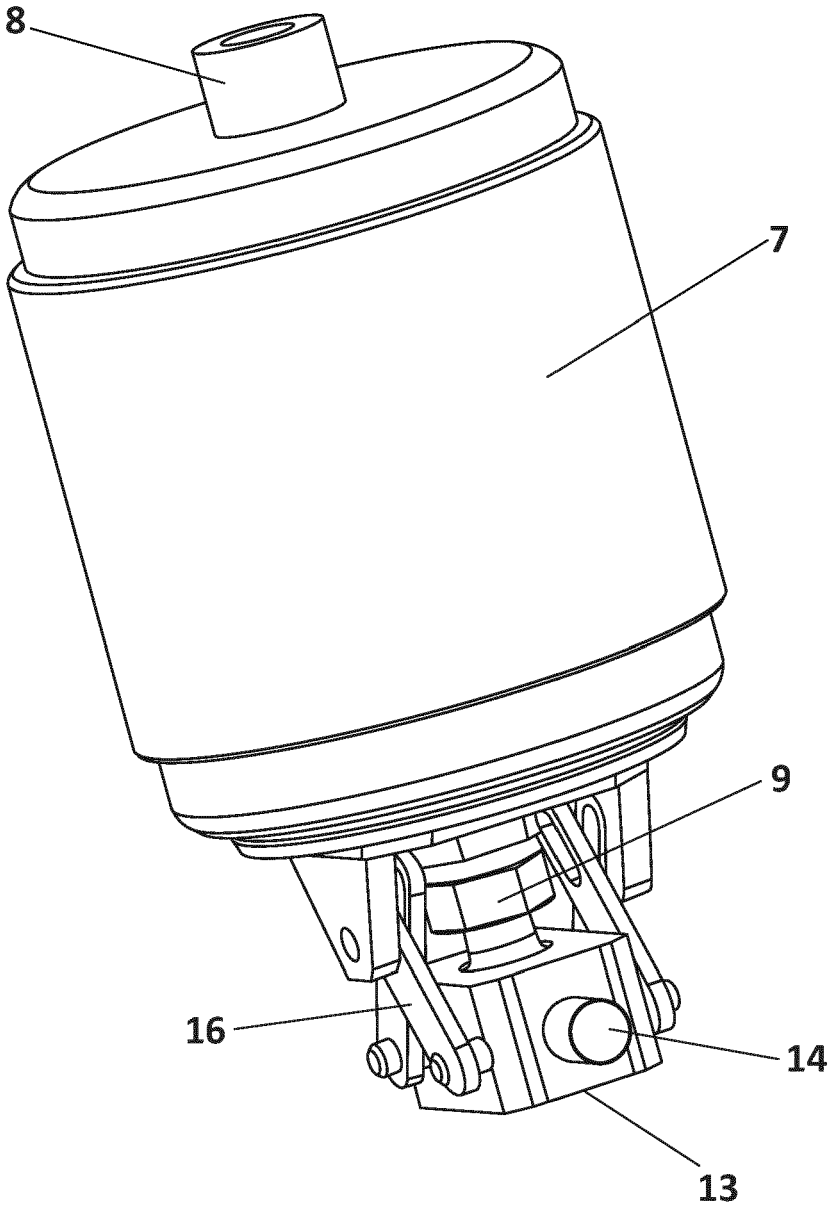

FIG. 10

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 38 2562

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	WO 2006/074975 A1 (SIEMENS AG [DE]; HOHMANN STEFAN [DE] ET AL.) 20 July 2006 (2006-07-20) * page 10, line 15 - page 16, line 11; figures 1-8 *	1-12	INV. H01H33/12 H01H33/666
A	US 2 480 622 A (WARNOCK FRANK E) 30 August 1949 (1949-08-30) * column 2, line 3 - column 3, line 72; figures 1,2 *	1-12	
A	US 2017/301491 A1 (ZHANG JIAOSUO [CN] ET AL) 19 October 2017 (2017-10-19) * paragraph [0034] - paragraph [0043]; figures 1-4 *	1-12	
A	EP 2 182 536 A1 (AREVA T & D SAS [FR]) 5 May 2010 (2010-05-05) * paragraph [0006] - paragraph [0018]; figures 1-14 *	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 October 2021	Ernst, Uwe

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 38 2562

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-10-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006074975 A1	20-07-2006	DE 102005002139 A1	27-07-2006
		WO 2006074975 A1	20-07-2006
US 2480622 A	30-08-1949	NONE	
US 2017301491 A1	19-10-2017	CN 104319166 A	28-01-2015
		US 2017301491 A1	19-10-2017
		WO 2016074525 A1	19-05-2016
EP 2182536 A1	05-05-2010	AU 2009230733 A1	13-05-2010
		BR PI0904400 A2	01-02-2011
		CN 101728115 A	09-06-2010
		EP 2182536 A1	05-05-2010
		ES 2387862 T3	03-10-2012
		FR 2937786 A1	30-04-2010
		JP 5612295 B2	22-10-2014
		JP 2010108934 A	13-05-2010
		RU 2009139903 A	10-05-2011
		US 2010102035 A1	29-04-2010

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- ES 2387862T3 **[0009] [0010]**
- ES 2526220T3 **[0009]**
- ES 2525080T3 **[0009]**
- DE 102004006476 B4 **[0009] [0013]**
- WO 2006074975 A1 **[0009] [0014]**