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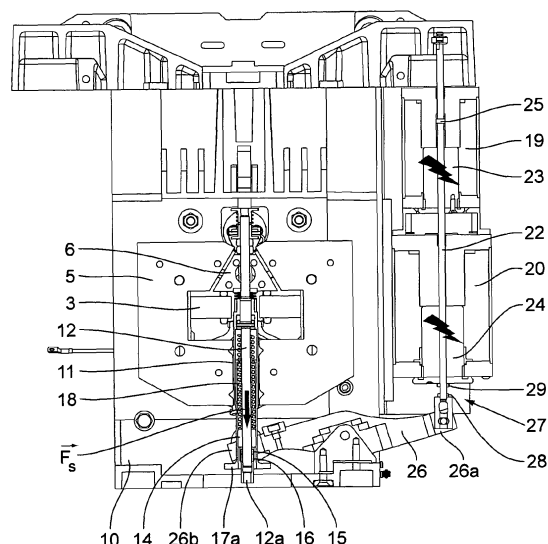
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(54) **Release mechanism for circuit interrupting device**

(57) The object of the present invention is a release mechanism (1) for a circuit interrupting device (2) comprising a ferromagnetic main frame (5) through which can flow a current (I) and a ferromagnetic movable element (6) designed to be translated in an opening (9) of the main frame (5) between a first position in which the circuit interrupting device (2) is closed and a second position in which the circuit interrupting device (2) is open. The release mechanism further comprises a spring (18) designed to maintain the movable element (6) in its first position and is designed to use the flux (B) generated inside the main frame (5) by the current (I) flowing through it to displace the movable element (6) between its first and second positions. The release mechanism further comprises at least one electromagnet (19, 20) acting on a ferromagnetic core (23, 24) to displace it between an on and an off position corresponding to the electromagnet (19, 20) being on respectively off. The said core (23, 24) is connected to mechanical means (22, 25, 26, 17) arranged to compress or stretch the spring (18) depending on the position of the core (23), so that the force ( $F_s$ ) on the movable element (6) due to spring (18) is adjusted, respectively increased or decreased, by switching the electromagnet on or off.

Fig.4



## Description

**[0001]** The present invention pertains to a release mechanism to be used in a circuit interrupting device such as a circuit breaker and in particular in a DC (direct current) circuit interrupting device.

**[0002]** Such circuit interrupting devices comprise a fixed contact element cooperating with a movable contact element. Under normal conditions these elements are in contact with each other and current in a main circuit is conducted between the elements. When breaking the current, the physical distance between these contact elements is increased by means of an electromechanical release mechanism.

**[0003]** The release mechanism opens the circuit interrupting device when a defined current through the circuit interrupting device is exceeded. These are usually passive mechanisms to offer the highest level of protection, and operate even on loss of the auxiliary supply voltage. In order to obtain this operation most release mechanisms use the magnetic field created by the current in the main circuit to activate a mechanical or magnetic trip system which opens the circuit interrupting device.

**[0004]** More precisely, a known release mechanism 100, as illustrated for example in figures 2a and 2b, usually comprises a main frame 101 and a movable element 102 designed to be displaced with respect to the main frame 101 between a first position in which the circuit interrupting device is closed and a second position in which the circuit interrupting device is open. The release mechanism 100 further comprises a spring 103 connected at one end to the movable element 102 and at the other end to the main body of the circuit interrupting device. The spring 103 exerts a spring force  $F_s$  on the movable element 102 which tends to maintain said movable element 102 in its first position.

**[0005]** When a current  $I$  flows in the main circuit and through the release mechanism 100, it creates a magnetic flux  $B_1$  flowing inside the main frame 101 and the movable element 102. The direction of the magnetic flux  $B_1$  depends on the direction of the current  $I$ : in figure 2b, the current  $I$  is perpendicular to the plane of the paper and directed towards the table, hence the magnetic flux  $B_1$  is then flowing clockwise inside the main frame 101 and the movable element 102. The said main frame 101 and movable element 102 are conformed so that the magnetic flux  $B_1$  creates a force  $F_B$  on the movable element 102 which tends to displace said element 102 into its second position. When the current  $I$  is great enough for the force  $F_B$  to be greater than the spring force  $F_s$ , then the movable element 102 is displaced into its second position thus opening the circuit interrupting device.

**[0006]** This limit value the current  $I$  has to exceed for the release mechanism 100 to open the circuit interrupting device is then determined by the value of the spring force  $F_s$ . Usually, the said spring force  $F_s$  is adjustable by stretching or compressing the spring 103 using some adjusting means, like for example a screw 104. A grad-

uation 105 can even be provided indicating the tension/compression of the spring 103 and thus the limit value of the release mechanism 100.

**[0007]** Such known release mechanism have some advantages: they operate according to the same condition (limit value) in both directions of the current  $I$  and the said condition is slightly adjustable. However, to adjust the spring force and the limit value, it is needed to totally break the current in the main circuit to which the circuit interrupting device is connected and to access physically the release mechanism and actuate the adjusting means.

**[0008]** There is therefore a need for a release mechanism for a circuit interrupting device which allows remote adjusting of the limit value for opening the circuit interrupting device without first breaking the current in the main circuit.

**[0009]** One object of the present invention is to provide an improved design of a release mechanism for an electromechanical circuit interrupting device which eliminates the inconveniences of the known mechanism.

**[0010]** The object of the present invention is a release mechanism for a circuit interrupting device comprising a ferromagnetic main frame through which can flow a current and a ferromagnetic movable element designed to be translated in an opening of the main frame between a first position in which the circuit interrupting device is closed and a second position in which the circuit interrupting device is open; a spring designed to maintain the movable element in its first position, the said release mechanism designed to use the flux generated inside the main frame by the current flowing through it to displace the movable element between its first and second positions, characterised in that it further comprises at least one electromagnet acting on a ferromagnetic core to displace it between an on and an off position corresponding to the electromagnet being on respectively off; the said core being connected to mechanical means arranged to compress or stretch the spring depending on the position of the core, so that the force on the movable element due to spring is adjusted, respectively increased or decreased, by switching the electromagnet on or off.

**[0011]** Another object of the present invention is a circuit interrupting device comprising such a release mechanism.

**[0012]** Other features, objects, uses and advantages of this invention will be apparent from the dependent claims and from the description which follows with reference to the accompanying drawings forming part thereof and wherein:

Figure 1 shows a circuit interrupting device incorporating an electromechanical release mechanism according to the invention.

Figures 2a and 2b, previously described, illustrate an example of a prior art release mechanism.

Figure 3a is a partial view of the release mechanism according to the invention and figure 3b is a sectional view of the release mechanism shown in figure 3a

along a plane parallel to the axis III-III and to the plane of the release mechanism.

Figure 4 illustrate the release mechanism according to the invention in a normal mode.

Figure 5 illustrate the release mechanism according to the invention in a first secured mode.

Figure 6 illustrate the release mechanism according to the invention in a second secured mode.

**[0013]** The release mechanism 1 according to the present invention is designed to be used in a conventional circuit interrupting device 2, such as a high voltage circuit breaker. For example, such a circuit interrupting device 2 is illustrated in figure 1 and traditionally comprises a circuit power line 3, a stationary contact element and a movable contact element (the contact elements are not visible on the figures).

**[0014]** When the two contact elements are in contact with each other the current is conducted through the circuit power line 3 and through the circuit interrupting device 2. In this relative position of the contact elements, the circuit interrupting device is said to be closed.

**[0015]** The release mechanism 1 according to the invention is designed to use the current flowing through the circuit interrupting device to activate an electromechanical trip system to move the movable contact element away from the stationary contact element and thus opening the circuit interrupting device 2 and interrupting the current.

**[0016]** For the sake of completeness, the circuit interrupting device 2 further comprises a blow-out device and/or an arc extinguishing chamber 4 to extinguish the electric arc created between the two separated contact elements when the circuit interrupting device is opened to totally interrupt the current. These components are well known to the person of ordinary skill in the art and won't be further described.

**[0017]** The release mechanism 1 according to the invention is illustrated in details in figures 3a and 3b.

**[0018]** The release mechanism comprises a ferromagnetic main frame 5 having the shape of a polygonal open ring and designed to surround the circuit power line 3 so that said line goes through the main frame 5. As it is an open ring, the main frame 5 presents a first and a second extremity 7, 8 defining between them an opening 9. The main frame 5 is rigidly fixed in a suitable way to the main body 10 of the circuit interrupting device 2 comprising the release mechanism 1.

**[0019]** Preferably, the main frame 5 is made by stacking layers of thin ferromagnetic laminations (not shown in the drawings for clarity reasons). For example, these laminations are made of silicon steel for its good magnetic properties and are 0.5 mm thick. Each lamination is insulated from its neighbours by a thin non conducting layer of insulating coating.

**[0020]** This type of construction for a release mechanism is well known. In particular, it is well known that the effect of the laminations is to reduce the magnitude of

eddy currents in the main frame 5. As for the number and the thickness of the laminations, it is also well known that thinner laminations further reduce the losses due to eddy currents but are more laborious and expensive to construct.

**[0021]** The main frame 5 further comprises a traversing bore 11 essentially perpendicular to the longitudinal axis of the circuit power line 3 (hence parallel to the axis III-III in figure 3a). An axle 12 extends freely through said bore 11 and through the opening 9. On said axle 12, is mounted the movable element 6. Said axle 12 and movable element 6 are designed to be translated along their longitudinal axis (the axis III-III in figure 3a), with respect to the main frame 5.

**[0022]** On a first extremity 12a of the axle 12 is arranged an abutment 14. Preferably, the position of the said abutment 14 on the axle 12 is determined and can be adjusted by suitable first adjusting means. For example, in the described embodiment, the said first adjusting means comprise a first nut 15 and a first locknut 16.

**[0023]** The second extremity 12b of the axle 12 is connected in a known way to the movable contact element of the circuit interrupting device 2 so that any displacement of the movable element 6 leads to a displacement of the movable contact element.

**[0024]** The movable element 6 can be translated in the opening 9 with respect to the main frame 5 between two positions: a first position, illustrated in the figures, in which the movable contact element 6 is in contact with the stationary contact element and thus the circuit interrupting device 2 is closed, allowing the current to flow through it and a second position in which the contact elements are space apart and the circuit interrupting device 2 is open, interrupting the current in the circuit power line 3.

**[0025]** As in a traditional release mechanism, the main frame 5 and the movable element 6 are conformed so that a magnetic flux flowing inside the main frame 5 and the movable element 6 will create a force on the movable element that tends to displace the latter into its second position. For example, as illustrated in the figures, the movable element 6 is a cone with the opening 9 (and the extremities 7, 8 of the main frame 5) having a complementary shape. In the figures, a magnetic flux flowing inside the main frame 5 and the movable element 6 will create a force that is upwardly directed, whatever the direction of the said flux. Obviously, other shapes are possible for the movable element 6 and the main frame 5.

**[0026]** The bore 11 is further adapted to receive a tube 17. The said tube 17 is designed to move freely in the bore 11 with respect to the main frame 5 and the axle 12. At one of its extremity 16a, the tube 16 is open and wide enough for the abutment 14 and the first adjusting means 15, 16 to enter the said tube.

**[0027]** Inside the tube 17 is placed a spring 18 having its first end 18a fixed to the other extremity 17b of the tube 17 and its second end 18b resting against the abutment 14. The spring 18, the abutment 14, the axle 12 and the movable element 6 are designed so that the said

spring 18 exerts a force  $F_s$  on the axle 12 and the movable element 6 directed along said axle 12 and tending to maintain the said movable element 6 in its first position. In the figures, the force  $F_s$  is downwardly directed.

**[0028]** Therefore, when a current  $I$  is flowing through the circuit power line 3, it creates a magnetic flux  $B_1$  flowing inside the main frame 5 and the movable element 6. This magnetic flux  $B_1$  creates in turn a force  $F_B$ , upwardly directed in the figures, that tends to move the movable element 6 into its second position. If the current  $I$  keeps increasing (for example in case of a short circuit) and exceeds some limit value where the force  $F_B$  is greater than the force  $F_s$  due to spring 18, then the movable element 6 will be displaced into its second position, thus opening the circuit interrupting device 2. This limit value depends then on the spring 18 and the force  $F_s$  due to the said spring.

**[0029]** The main aim of the present invention is to provide a release mechanism for which this limit value can be easily remotely adjusted without first breaking the current in the main circuit.

**[0030]** The release mechanism according to the invention comprises at least one electromagnet but preferably a first and a second electromagnets 19, 20 (hereafter EM19 and EM20). These electromagnets 19, 20 are preferably rigidly fixed on the main body 10 of the circuit interrupting device 2. These two electromagnets 19, 20 are powered by an auxiliary power circuit and remotely controlled. The said auxiliary circuit and controlling means are well known to the person of ordinary skill in the art and won't be further described.

**[0031]** The said electromagnets 19, 20 are arranged to act on a rod 22 and displace it between preferably three following positions each depending on whether each electromagnet 19, 20 is powered or not:

- a minimal position determined by both the electromagnets 19, 20 being powered (EM19:on ; EM20:on);
- an intermediate position determined by the first electromagnet 19 being powered but the second electromagnet 20 being off (EM19:on ; EM20:off), and;
- a maximal position determined by both the electromagnets 19, 20 being off (EM19:off; EM20:off).

**[0032]** The movements of the rod 22 are transmitted to the tube 17 so that the said tube 17 is translated along its longitudinal axis when the rod 22 is displaced. Due to the configuration of the spring 18 inside the tube 17, each displacement of the said tube along its longitudinal axis induces compression or stretching of the spring 18 depending on the direction of the movement. As illustrated in the figures, when the tube 17 is moved downwardly, the spring 18 is compressed and the force  $F_s$  on the axle 12 and the movable element 6 becomes greater, while when the tube 17 is moved upwardly, the spring 18 is stretched and the force  $F_s$  decreases.

**[0033]** Therefore, to each position of the rod 22 corresponds a position of the tube 17. Said positions of the tube 17 determine each a value of the force  $F_s$  due to the spring 18 and so a limit value the current  $I$  has to exceed for the release mechanism to open the circuit interrupting device 2. So, by just switching on or off the electromagnets 19, 20, one can select a limit value for the release mechanism. This can be done remotely and even when a current  $I$  is flowing through the circuit interrupting device 2. Moreover the operation is instantaneous.

**[0034]** An embodiment of the electromagnets 19, 20, the rod 22 and the transmission of the movement of the rod 22 to the tube 17 will now be described in detail in reference to figures 4 to 6.

**[0035]** Preferably, the first electromagnet 19 is stacked upon the second electromagnet 20 along an axis A parallel to the axle 12. The first electromagnet 19 acts on a first core 23 so that the said core 23 is displaced upwardly along the axis A into an on position when the first electromagnet 19 is powered on. When the first electromagnet 19 is switched off, the said first core 23 is then displaced downwardly along the axis A into an off position. The second electromagnet 20 acts in turn on a second core 24 so that said core 24 is displaced upwardly along the axis A into an on position when the said second electromagnet 20 is on. The first and second cores 23, 24 are made of ferromagnetic material.

**[0036]** The rod 22 is parallel to the axis A and is traversing each of the electromagnets 19, 20 and the cores 23, 24. The said rod 22 can be freely translated along the axis A with respect to the electromagnets 19, 20 and the first core 23 of the first electromagnet 19. The second core 24 of the second electromagnet 20 is rigidly fixed on the said rod 22. A protuberance 25 is set on the rod 22 above the first core 23 of the first electromagnet 19 and is shaped so that it cannot pass through the said first core 23.

**[0037]** The electromagnets 19, 20, their respective first and second cores 23, 24, the rod 22 and the protuberance 25 are arranged so that:

- when both electromagnets 19, 20 are powered (EM19:on ; EM20:on) as illustrated on figure 4 (power is schematically represented by a lightning bolt), their respective cores 23, 24 are in their respective on position and the rod 22 is in its minimal position;
- when the first electromagnet 19 is kept on but the second electromagnet 20 is switched off as illustrated on figure 5 (EM19:on ; EM20:off), the first core 23 of the first electromagnet 19 remains in its on position while the second core 24 of the second electromagnet 20 is now free to move downwardly along the axis A. The said second core 24 and the rod 22 are stopped by the protuberance 25 coming into contact with the first core 23. The protuberance 25 determines then the intermediate position of the rod 22.
- When both electromagnets 19, 20 are switched

off as illustrated in figure 6 (EM19: off; EM20: off), the first core 23 is moved into its off position. As the protuberance 25 is resting against said first core 23, the rod 22 is further moved downwardly into its maximal position.

**[0038]** The rod 22 is connected to a first end 26a of a lever 26 pivotably mounted on the main body 10 of the circuit interrupting device 2. Preferably, the rod 22 is connected to the lever 26 by means of second adjusting means 27, comprising for example a bottom locknut 28 and an upper locknut 29. The second end 26b of the lever 26 is connected to the tube 17 so that each movement of the rod 22 due to the electromagnets 19, 20 is transmitted to the tube 17 and the spring 18 by the lever 26.

**[0039]** As illustrated in figure 4, the components of the release mechanism according to the invention previously described are arranged so that when the rod 22 is in its minimal position, the compression of the spring 18 is maximal and therefore the force  $F_s$  of the spring 18 on the abutment 14, the axle 12 and the movable element 6 is maximal. In this configuration of the release mechanism 1, hereafter referred to as the normal mode (EM19: on; EM20: on), the current  $I$  has to exceed a first limit value for the said release mechanism 1 to open the circuit interrupting device 2. The said first limit value is determined as the intensity of the current  $I$  needed for the force  $F_B$  due to the magnetic flux  $B$  generated by the current  $I$  inside the main frame 5 and the movable element 6 to be greater than the force  $F_s$  due to the spring 18.

**[0040]** Figure 5 illustrates the configuration of the release mechanism 1 with the rod 22 being in its intermediate position. In this configuration of the release mechanism 1, hereafter referred to as the first secured mode (EM19: on; EM20: off), the compression of the spring 18 is lesser than in the normal mode and so is the force  $F_s$ . The current  $I$  has to exceed a second limit value for the said release mechanism 1 to open the circuit interrupting device 2, with said second limit value being lower than the first limit value.

**[0041]** Finally, the last configuration of the release mechanism 1 according to the described embodiment and hereafter referred to as the second secured mode (EM19: off; EM20: off), is illustrated in figure 6. In this configuration, the spring 18 is the least compressed, hence the force  $F_s$  is the smallest. The current  $I$  has to exceed a third limit value for the said release mechanism 1 to open the circuit interrupting device 2, with said third limit value being lower than the second limit value.

**[0042]** The first, second and third limit values are co-dependent. In the described embodiment of the release mechanism according to the invention, the said limit values can be set as follow.

**[0043]** In the second secured mode, with both electromagnets 19, 20 off, one can adjust the compression of the spring 18 via the first adjusting means, more precisely the first nut 15 and the first locknut 16. By screwing or unscrewing the said adjusting means on the axle 12, the

position of the abutment 14 on the said axle 12 can be set and so the compression of the spring 18. Preferably, the tube 17 comprises a scale helping the user adjust the compression of the spring 18. For example, the compression of the spring 18 can be adjusted so that in this second secured mode, the release mechanism 1 opens the circuit interrupting device when a current  $I$  flowing through it exceeds 1500 A.

**[0044]** After setting the third limit value, one can switch on the first electromagnet 19 and adjust the second limit value and the compression of the spring 18 using the second adjusting means 27 that adjusts the relative position of the rod 22 and the lever 26.

**[0045]** Finally, one can switch the second electromagnet 20 on and adjust the first limit value by the same procedure that the second.

**[0046]** It is therefore provided a release mechanism for a circuit interrupting which allows easily, remotely and instantaneously switching between at least two operational modes each characterised by a different limit value the current has to exceed for the release mechanism to open the circuit interrupting device. The switching can happen any time even when current is flowing through the release mechanism and the circuit interrupting device. The said operational modes can preferably be adjusted by the user. Moreover, the described construction is easy and not space consuming. It can be for example easily fit into a previously designed circuit interrupting device.

**[0047]** Of course, the embodiment described above is in no way limiting and can be the subject of all desirable modifications within the framework defined by the claims.

**[0048]** The release mechanism according to the invention could comprise only one electromagnet acting on the rod 22 it between at least two positions whether it's on or off, the said at least two positions of the rod 22 determining corresponding positions of the spring 18 and hence limit values for the release mechanism.

**[0049]** It is clear that as a variant of the described embodiment, the rod and/or the lever could be replaced by any suitable mechanical means actuated by the electromagnet(s) and arranged to displace the tube along its axis between at least two positions determining two levels of compression of the spring 18 inside the tube 17.

## Claims

1. Release mechanism (1) for a circuit interrupting device (2) comprising a ferromagnetic main frame (5) through which can flow a current ( $I$ ) and a ferromagnetic movable element (6) designed to be translated in an opening (9) of the main frame (5) between a first position in which the circuit interrupting device (2) is closed and a second position in which the circuit interrupting device (2) is open; a spring (18) designed to maintain the movable element (6) in its first position, the said release mechanism designed to

use the flux (B) generated inside the main frame (5) by the current (I) flowing through it to displace the movable element (6) between its first and second positions, **characterised in that** it further comprises at least one electromagnet (19, 20) acting on a ferromagnetic core (23, 24) to displace it between an on and an off position corresponding to the electromagnet (19, 20) being on respectively off; the said core (23, 24) being connected to mechanical means (22, 25, 26, 17) arranged to compress or stretch the spring (18) depending on the position of the core (23), so that the force ( $F_s$ ) on the movable element (6) due to spring (18) is adjusted, respectively increased or decreased, by switching the electromagnet on or off.

2. Release mechanism (1) according to claim 1, **characterised in that** the at least one electromagnet (19, 20) is remotely controlled.
3. Release mechanism (1) according to any of the preceding claims, **characterised in that**, the mechanical means comprise a rod (22) driven by the core (23) and a lever (26) pivotably mounted on the circuit interrupting device (2) and connected to both the rod (22) and the spring (28).
4. Release mechanism (1) according to claim 3, **characterised in that** it comprises a first and a second electromagnets (19; 20) each acting on a respective core (23, 24), the core (24) of the second electromagnet (29) being rigidly fixed on the rod (22) and the core (24) of the first electromagnet (19) acting on the rod (22) by means of a protuberance (25) of the said rod (22) abutting against said core (24, the electromagnets (19; 20) and their cores (23, 24) being arranged so that the spring (18) is compressed or stretched between three levels.
5. Circuit interrupting device (2) comprising a release mechanism according to any one of claims 1 to 4.

Fig.1

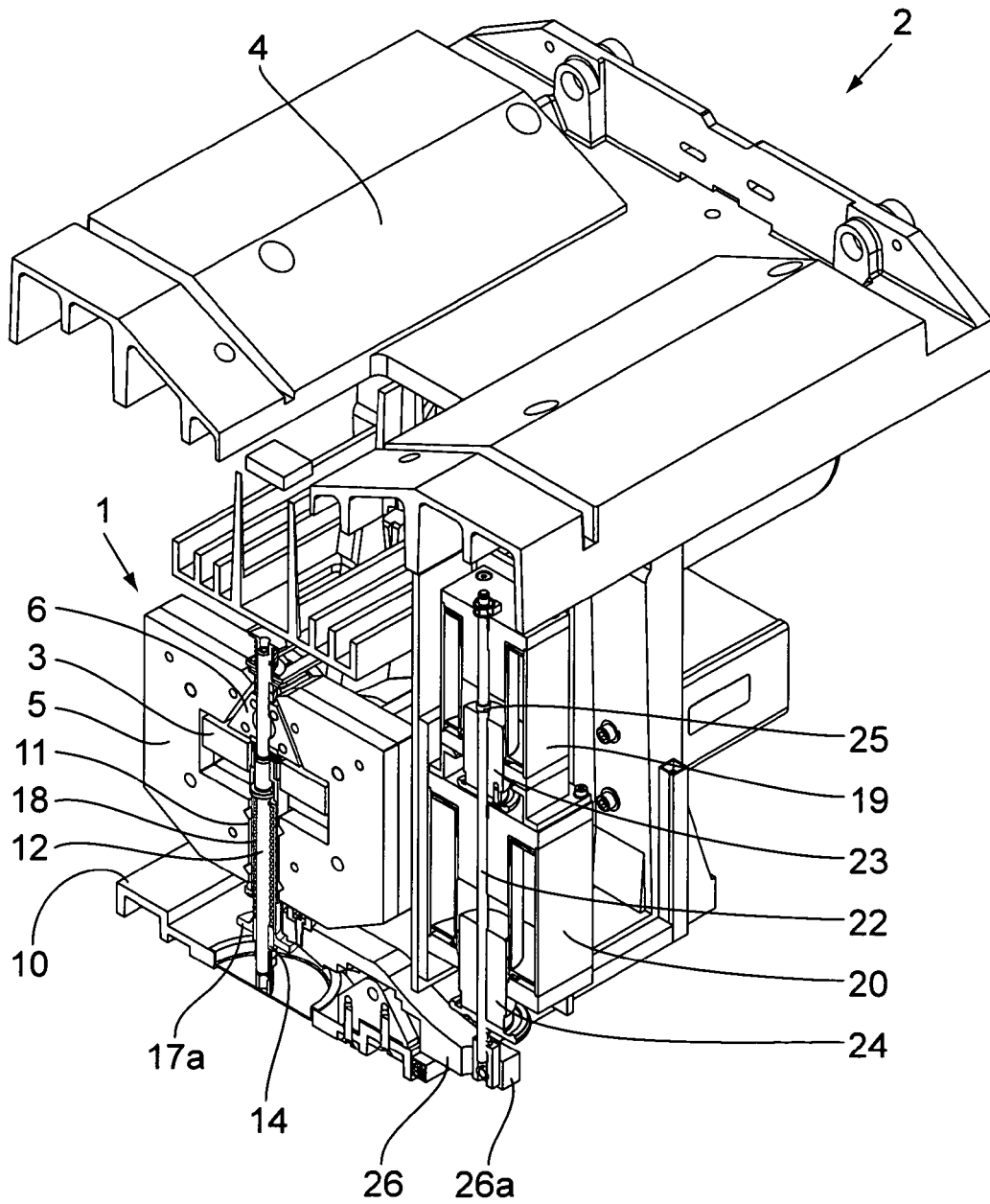


Fig.2a

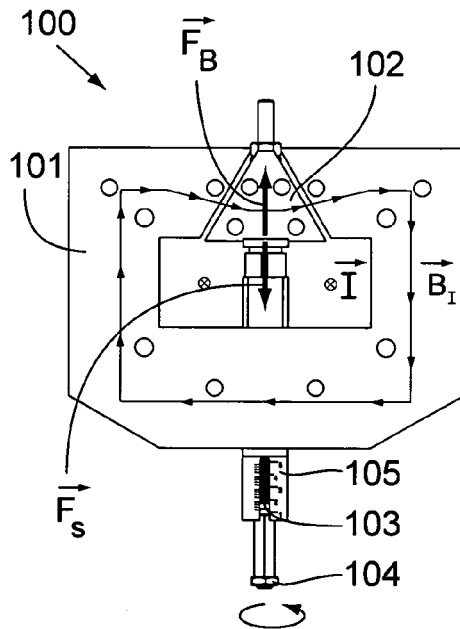


Fig.2b

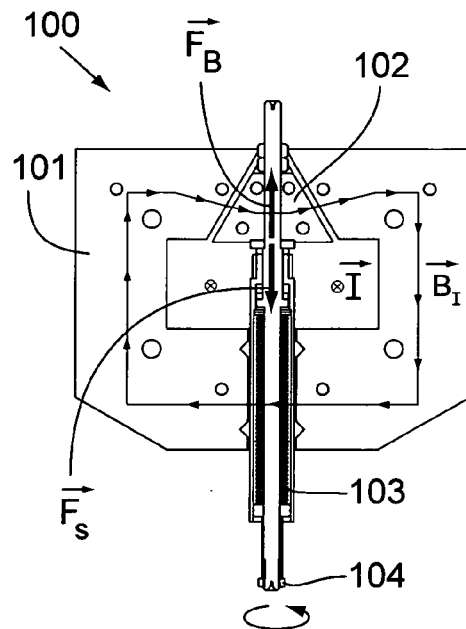


Fig.3a

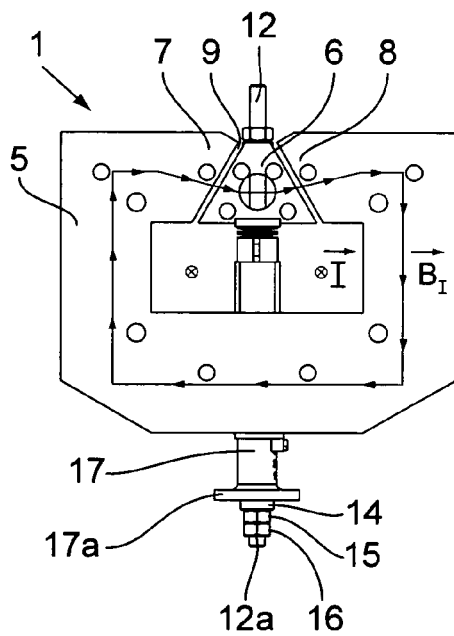


Fig.3b

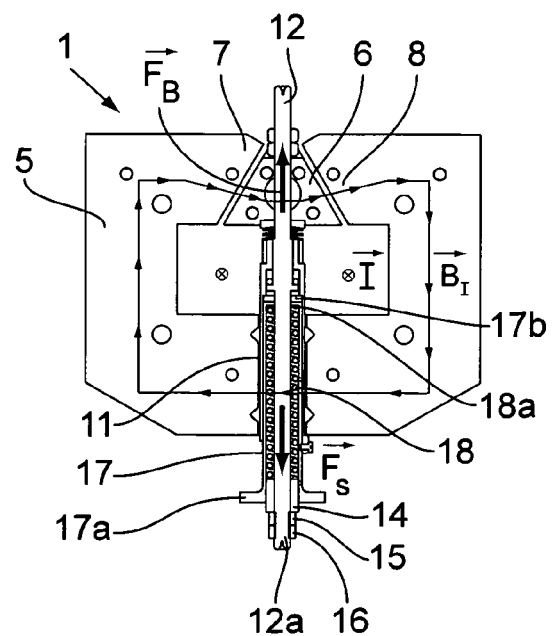


Fig.4

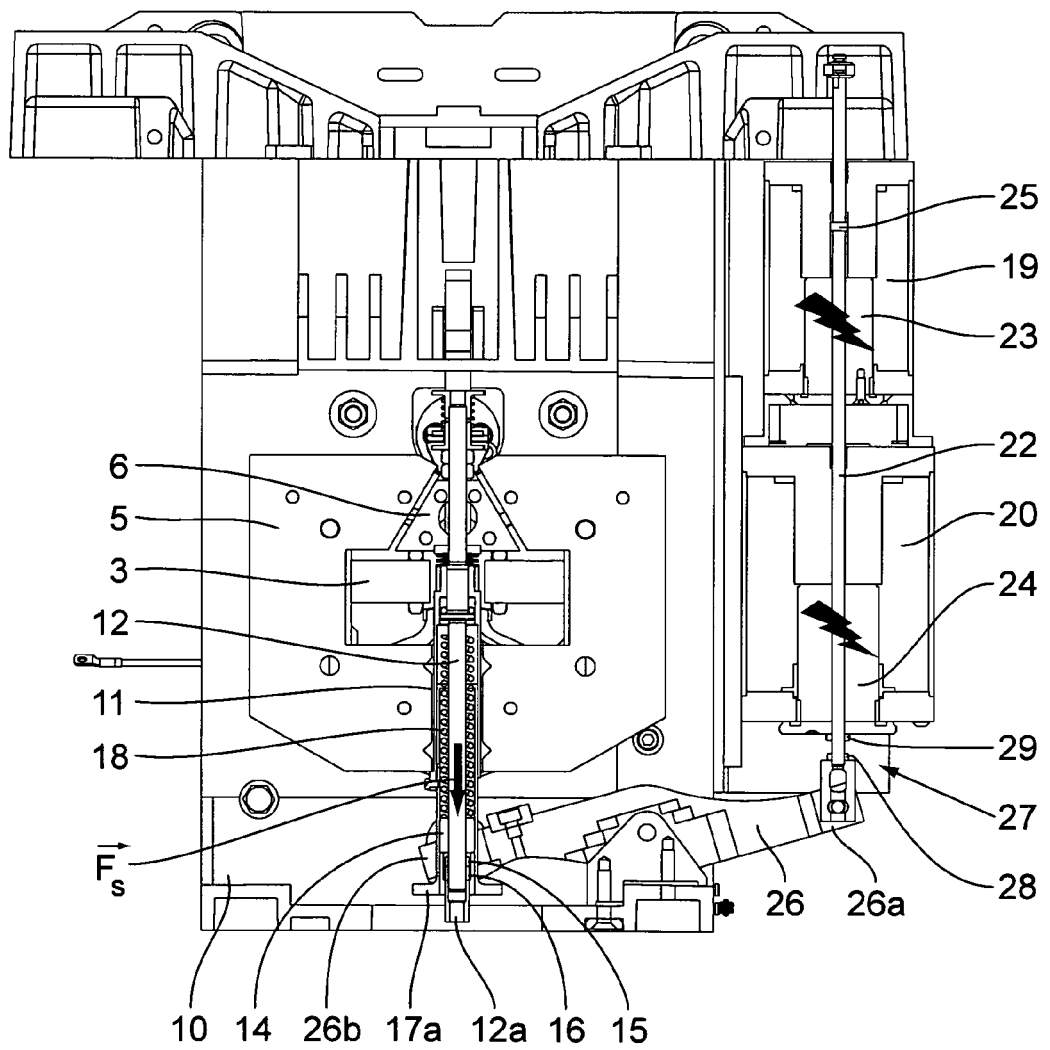


Fig.5

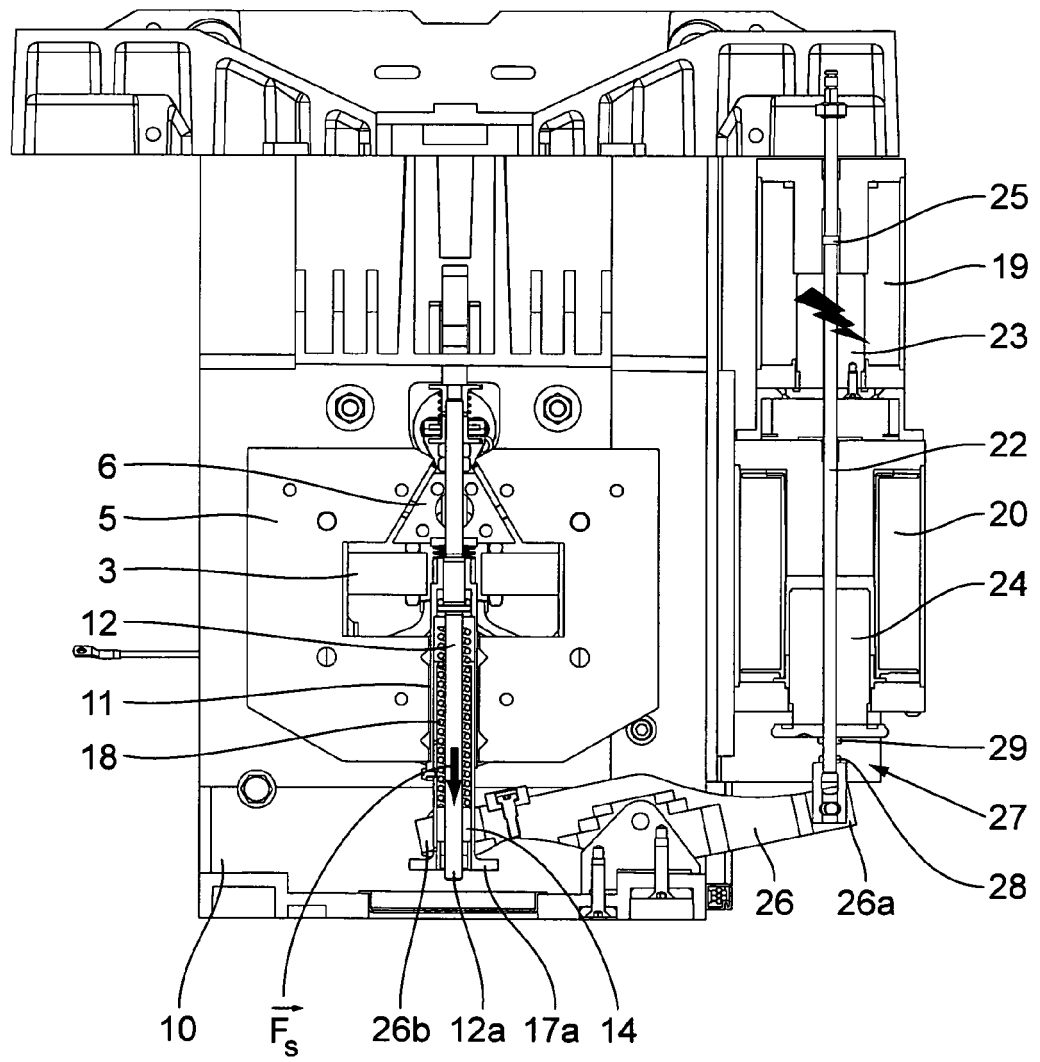
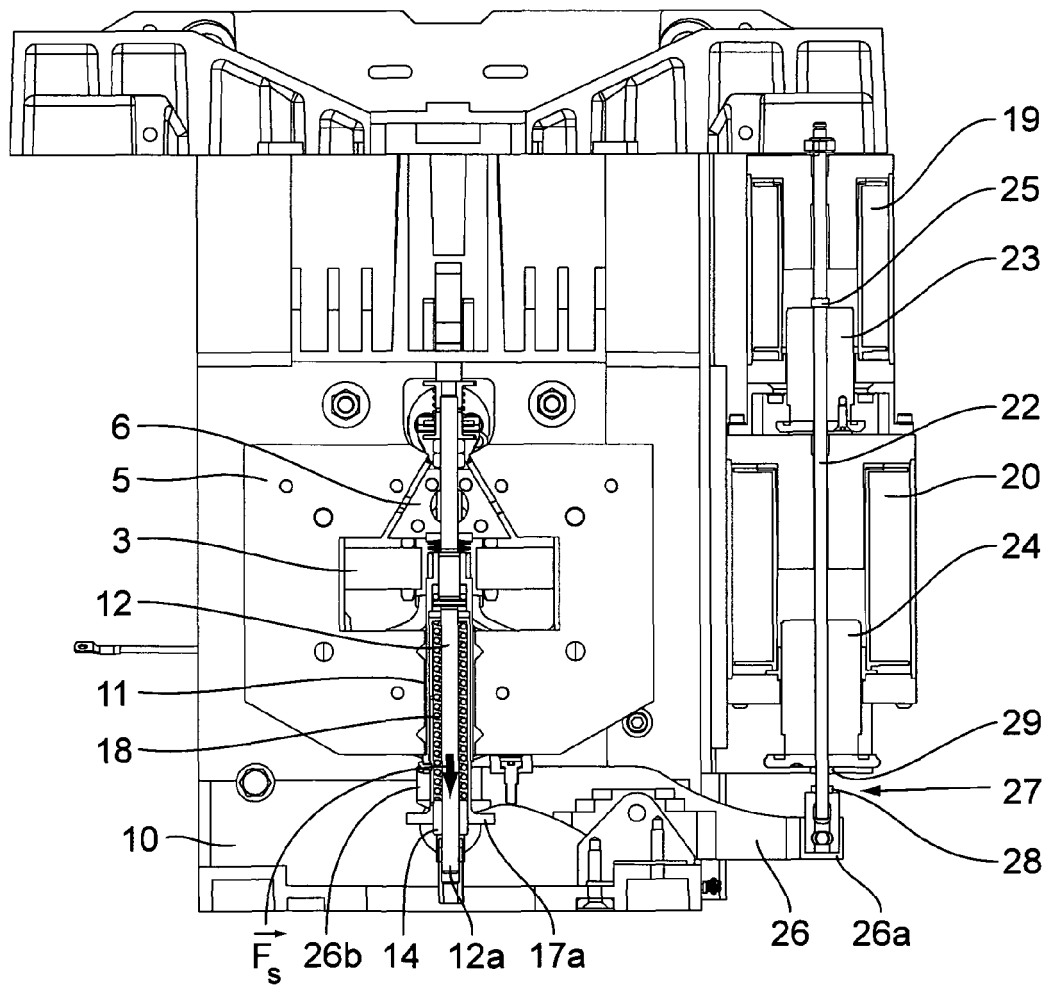


Fig.6





## EUROPEAN SEARCH REPORT

Application Number  
EP 10 00 9920

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                |                                                      |                                         |
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| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                                                                                                                                                                                                  | Relevant to claim                                    | CLASSIFICATION OF THE APPLICATION (IPC) |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DE 197 15 114 A1 (AEG NIEDERSpannungSTECH GMBH [DE]) 22 October 1998 (1998-10-22)<br>* the whole document *                                                                                                                                                                                                                                                                                    | 1                                                    | INV.<br>H01H71/74                       |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | GB 1 439 431 A (LICENTIA GMBH)<br>16 June 1976 (1976-06-16)<br>* the whole document *                                                                                                                                                                                                                                                                                                          | 1                                                    |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | AEG low voltage: "User's Guide High Speed DC Circuit breaker Type GERAPID 2607/8007",<br>22 September 2009 (2009-09-22),<br>XP002624666,<br>Retrieved from the Internet:<br>URL: <a href="http://www.aegelettra.com/download/pdf/Gerapid_2010.pdf">http://www.aegelettra.com/download/pdf/Gerapid_2010.pdf</a><br>[retrieved on 2011-02-24]<br>* paragraphs [2.3.2], [ 3.2.4]; figures 3,4,7 * | 1                                                    |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DATABASE WPI<br>Week 200920<br>Thomson Scientific, London, GB;<br>AN 2009-F59090<br>XP002624667,<br>& CN 201 188 403 Y (SECHERON SA)<br>28 January 2009 (2009-01-28)<br>* abstract *                                                                                                                                                                                                           | 1                                                    | TECHNICAL FIELDS SEARCHED (IPC)<br>H01H |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                |                                                      |                                         |
| Place of search<br>Munich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                | Date of completion of the search<br>24 February 2011 | Examiner<br>Ramírez Fueyo, M            |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                                                                                                                                                                                                                                                                |                                                      |                                         |

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EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 00 9920

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  
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24-02-2011

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|----|---------------------|----------------------------|---------------------|
| DE 19715114                               | A1 | 22-10-1998          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |
| GB 1439431                                | A  | 16-06-1976          | DE 2305468 A1              | 08-08-1974          |
|                                           |    |                     | FR 2216666 A1              | 30-08-1974          |
|                                           |    |                     | IT 1007219 B               | 30-10-1976          |
| -----                                     |    |                     |                            |                     |
| CN 201188403                              | Y  | 28-01-2009          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |