

Description

Field of the invention

[0001] The present invention relates to residual current safety switches, more particularly to a main switch arrangement to be used in them.

Background of the invention

[0002] A device provided with a residual current safety switch is a residual current safety switch that protects an electrical device connected to it and people in the proximity of it from dangerous electric shocks in a residual current situation by causing the tripping of one or more contacts.

[0003] A residual current safety switch operates in such a way that in a normal situation in a single-phase circuit the electric current coming from a phase conductor returns via the neutral conductor to the network. If current is leaking from an electrical conductor or from a device connected to it to outside the device, e.g. via a person who touched a live part, to true earth or to a guard wire, the inbound current and the return current are no longer of equal magnitudes. If the difference in the currents increases past a permitted value, the residual current protection disconnects the current.

[0004] There are two types of residual current safety switches: those that are dependent on operating voltage, provided with technology based on electronic measuring and on tripping occurring electronically in a fault current situation; and residual current safety switches that are independent of operating voltage, provided with tripping technology occurring by means of a summation current transformer and a current-sensitive relay.

[0005] Residual current safety switches known in the art that are independent of voltage are, with regard to the main switch assembly, structurally very complex and too large in their physical dimensions for use e.g. in devices having a main switch assembly on a circuit card, and the possibility of installing also other components associated with the functioning of the residual current safety switch either onto the same circuit card or in the proximity of the main switch assembly on the circuit card.

Summary of the invention

[0006] The purpose of the present invention is to simplify the structure of a residual current safety switch, and to provide an entirely new type of residual current safety switch with the main switch arrangement of the residual current safety switch being constructed in a completely new manner.

[0007] In the solution of the invention, the main switch arrangement for a residual current safety switch comprises a main shaft movable in the vertical direction and a trip part arranged essentially around the main shaft, which trip part is adapted to turn around the main shaft,

an actuator and a summation current transformer connected electrically to it, which actuator is arranged essentially in connection with the trip part, at least one return spring and a contact module. The main shaft, trip part, return spring and actuator are arranged in such a way that in a fault current situation a protrusion projecting from the actuator is adapted to push the trip part and to bring about a rotational motion in the trip part, and wherein the rotational motion of the trip part is further adapted to release the spring force formed by the return spring, said spring force lifting the main shaft and/or lowering the contact module, in such a way that the contact module of the main switch in connection with the main shaft displaces into an electrically non-conductive state.

[0008] The characteristic features of the main switch arrangement for a residual current safety switch according to the invention are described in detail in claim 1 below, and those of its preferred embodiments in the other claims.

[0009] In one embodiment of the invention the trip part placed around the vertical shaft of the main switch arrangement of the residual current protection can, in a fault current situation, be controlled to displace the main switch contact module disposed around the vertical shaft of the main switch arrangement of the residual current protection into its opened state when an external force produced by some measured fault situation is exerted on the protrusion of the trip part, in which case after the contact part has displaced away from the circuit card, the output connectors of the residual current protection become deenergized.

[0010] In one embodiment of the invention the trip part placed around the main shaft of the main switch arrangement of the residual current protection can be controlled to displace the main switch contact module disposed around the main shaft of the main switch arrangement of the residual current protection into its opened state when an external force is exerted on the protrusion of the trip part, without a measuring event of the fault current situation, i.e. fully independently of the voltage, e.g. via a pushbutton fitted into connection with the arrangement and a force being exerted on which pushbutton that can be conducted into the trip part.

[0011] In one embodiment of the invention the trip part placed around the main shaft of the main switch arrangement of the residual current protection returns in conjunction with tripping of the residual current protection, after automatic mechanical functioning of the actuator in a fault current situation, back to its armed state.

[0012] In one embodiment of the invention the protrusion in the trip part placed around the main shaft of the main switch arrangement of the residual current protection can be disposed to function on the outer rim of the trip part at a freely selected angle to and distance from the center part of the trip part, i.e. as viewed from the point of origin, and there can also be more than one of these protrusions on the outer rim of the trip part in question.

[0013] In one embodiment of the invention there are two locking receptacles in shaped grooves in the main shaft of the main switch arrangement of the residual current protection and, when pressing the main shaft of the main switch arrangement into said locking receptacles, the trip part to be placed around said main shaft locks, by means of locking counterpieces on the inside surface of the trip part, after the downward force ceases, and this contact opens only by means of an external force being exerted on the protrusion on the outer rim of the trip part.

[0014] In one embodiment of the invention turning of the vertical shaft of the main switch arrangement of the residual current protection with a rotational motion is normally prevented but, e.g. with an additional piece being placed as an extension of the vertical shaft of the main switch arrangement, a simulation of a fault current situation and tripping of the residual current protection can be brought about by means of a rotational motion of said additional piece and an external test contact.

[0015] In one embodiment of the invention the arrangement comprise a reset part and, although turning of the vertical shaft of the main switch arrangement of the residual current protection with a rotational motion is normally prevented, by means of the reset part placed around the vertical shaft of the main switch arrangement, the main switch arrangement can be made to open by turning the main shaft and, by means of the same spring force associated with the reset part, the main shaft displaces back into its starting position.

[0016] In one embodiment of the invention, by means of the contact module placed around the main shaft of the main switch arrangement of the residual current protection, all the main currents traveling via the residual current safety switch can be switched on and switched off. In one embodiment of the invention more than two connecting strips can be connected to the contact module placed around the main shaft of the main switch arrangement of the residual current protection.

[0017] In one embodiment of the invention there is a locking cavity at the top end of the vertical shaft of the main switch arrangement of the residual current protection. In one embodiment of the invention extension pieces of different lengths and different shapes can be installed parallel with the main shaft in the locking cavity at the top end of the vertical shaft of the main switch arrangement of the residual current protection. In one embodiment of the invention the extension pieces installed parallel with the vertical shaft in the locking cavity at the top end of the main shaft of the main switch arrangement of the residual current protection are locked together by means of a locking piece installed around the main shaft.

[0018] In one embodiment of the invention the residual current protection arrangement can be arranged e.g. on a circuit card, allowing placement of an actuator directly next to the switch arrangement, on the same circuit card, in which case, in a measured residual current protection situation, when the residual current protection activates, the shaft projecting from the actuator directly engages

the protrusion of the trip part, making the switch arrangement and main contact open. The fact that re-arming the actuator occurs by means of the protrusion of the trip part makes the assembly of a device provided with a switch arrangement according to the invention as simple as possible because when a measured fault current situation in an activation situation of the actuator causes projection of the actuator between the shaft and the switch arrangement, no information tripping the main switch arrangement and received via intermediate shafts or spring-loaded contacts, in the way that these functions are implemented in voltage-independent residual current devices currently known in the art, is needed either in a tripping situation or in a re-arming situation.

[0019] The main switch arrangement of a residual current protection according to the invention can also be used, owing to its advantageous physical size, as a main switch arrangement for residual current safety switches functioning as an appliance on the front of various sockets provided with residual current protection, e.g. the sockets of kitchen light fittings and bathroom light fittings.

Short description of the drawings

[0020] In the following, the invention will be described in more detail by the aid of an embodiment with reference to the attached drawings, wherein

Fig. 1 presents a side view of a main switch arrangement according to one embodiment of the invention, with all the parts separated,

Fig. 2 presents a partially sectioned side view of a main switch arrangement according to one embodiment of the invention, with all parts installed in the open OFF state,

Fig. 3 presents a partially sectioned side view of a main switch arrangement according to one embodiment of the invention, with all parts installed in the closed ON state,

Fig. 4 presents a main switch arrangement according to one embodiment of the invention, the trip part of it and an actuator, when the protrusion of the trip part is disposed in an advantageous location in the closed ON state of the main switch,

Fig. 5 presents a main switch arrangement according to one embodiment of the invention, the trip part of it and an actuator, when the protrusion of the trip part is disposed in an advantageous location in the open OFF state of the main switch,

Fig. 6 presents an extension piece installed in the locking cavity at the top end of the vertical shaft of the main switch arrangement according to one embodiment of the invention, and a locking piece lock-

ing the vertical shaft and the extension piece together,

Fig. 7 presents the arrangement of the contact module of the main switch arrangement according to one embodiment of the invention,

Figs. 8.1 - 8.4 present the locations of the main shaft and of the trip part of the main switch arrangement according to one embodiment of the invention according to the different location points of the main shaft in different situations,

Fig. 9 presents the displacement of the trip part of the main switch arrangement according to one embodiment of the invention from the armed state into its tripped state by means of an external actuator independent of the fault current situation, and

Fig. 10 presents an explosion drawing of a main switch arrangement according to one embodiment of the invention.

Description of preferred embodiments of the invention

[0021] The solution of the invention relates to a main switch arrangement for a residual current safety switch, which arrangement comprises a main shaft movable in the vertical direction and a trip part arranged essentially around the main shaft, which trip part is adapted to turn around the main shaft, an actuator and a summation current transformer connected electrically to it, which actuator is arranged essentially in connection with the trip part, at least one return spring and a contact module. The main shaft, trip part, return spring and actuator are arranged in such a way that in a fault current situation a protrusion projecting from the actuator is adapted to push the trip part and to bring about a rotational motion in the trip part, and wherein the rotational motion of the trip part is further adapted to release the spring force formed by the return spring, said spring force lifting the main shaft and/or lowering the contact module, in such a way that the contact module of the main switch in connection with the main shaft displaces into an electrically non-conductive state.

[0022] Fig. 1 presents a main switch arrangement according to one embodiment of the invention. Topmost in the embodiment of Fig. 1 are the extension piece 6 and locking piece 5 of the main shaft 1, by means of which locking piece the extension piece is arranged to remain attached to the main shaft 1. Below the locking piece 5 is a return spring 8 around the main shaft 1, and below that the frame part 4 and circuit card 11. On the bottom surface of the circuit card are contact pins 14, e.g. four contact pins. Under the circuit card is the return spring 9 of the contact module, around the main shaft 1, and a switch package 3, in which are guide-motion limiters 16

connecting to the frame part 4, two connection bridges 10 belonging to the switch package 3, the trip part 2, the main shaft 1, in which are two shaped grooves 22 in its longitudinal direction, and the lower guide 7 of the main shaft.

[0023] Fig. 2 presents a partially sectioned side view of a main switch arrangement according to one embodiment of the invention, with all parts installed in the open OFF state, i.e. in the state in which an electrically conductive contact is not formed. Fig. 2 presents, in addition to the parts referred to in Fig. 1: more details concerning the shape of the main shaft 1 and trip part 2: in this embodiment, the main shaft 1 has two locking receptacles 17 and on the inside surface of the trip part 2 there are two locking counterpieces 18.

[0024] Fig. 3 presents a partially sectioned side view of a main switch arrangement according to one embodiment of the invention, with all parts installed in the closed ON state, in which an electrically conductive contact is formed between the contact pins 14 and the connection bridges 10 by means of the switch.

[0025] Fig. 4 presents a main switch arrangement according to one embodiment of the invention, the trip part 2 of it and an actuator 12, when the protrusion 15 of the trip part is disposed in an advantageous location in the closed ON state of the main switch, in which no fault current has been detected. In this situation, the protrusion 13 of the actuator is at least mainly inside the actuator.

[0026] Fig. 5 presents a main switch arrangement according to one embodiment of the invention, the trip part 2 of it and an actuator, when the protrusion 15 of the trip part is disposed in an advantageous location in the open OFF state of the main switch, in which a fault current has tripped the actuator. Based on detection of a fault current, the protrusion 13 of the actuator pushes out from being mainly inside the actuator and engages the protrusion 15 of the trip part, pushing the protrusion of the trip part and making the trip part 2 turn around the main shaft 1.

[0027] Fig. 6 presents an extension piece 6 installed in the locking cavity at the top end of the vertical shaft 1 of the main switch arrangement according to one embodiment of the invention, and a locking piece 5 locking the vertical shaft and the extension piece together. By means of the extension piece 6, the main shaft can be arranged to extend to outside various enclosure solutions for residual current protection, and also by means of the extension piece 6 the appearance of that portion of the arrangement that is externally visible can be modified. This enables e.g. the use of exterior pushbutton parts of different colors, shapes and sizes together with similar interior structures.

[0028] Fig. 7 presents in more detail the arrangement of the contact module of the main switch arrangement according to one embodiment of the invention. The figure shows the motion limiters 16, the two connection bridges 10 comprised inside the switch package 3, the trip part 2, the lower guide 7 of the main shaft.

[0029] Figs. 8.1 - 8.4 present the positions of the main

shaft 1 and of the trip part 2 of the main switch arrangement according to one embodiment of the invention according to the different location points of the main shaft in different situations. The main switch arrangement according to the embodiment presented in Figs. 1 - 7 functions in such a way that when a thrusting force is exerted on the extension piece 6 of the vertical shaft, owing to the downward force in the direction of the vertical shaft 1, the vertical shaft 1 displaces through the frame part 4 and the switch package 3, and also through the trip part 2 in connection with it and the lower guide 7. The frame part 4 has protrusions to be placed in the grooves in the main shaft 1, preventing turning of the main shaft 1. The locking counterpieces 18 of the trip part 2 displace along with the motion of the main shaft 1 to on top of the locking receptacles 17 in the main shaft 1, and at the same time the wall 19 displaces into the armed position of the trip part 2, as is presented in Figs. 4 and 8.1, simultaneously, by means of the protrusion 15 of the trip part 2, also arming the part 13 pushing out from the actuator 12 into its armed position mainly inside the actuator 12.

[0030] After the force acting downwards on the main shaft 1 of the main switch arrangement, in the direction of its shaft, is removed, the main shaft rises back into its upper position from the force of the return spring 8, locking the trip part 2 to the main shaft 1, as is presented in Fig. 8.2, at the same time lifting the switch package 3 into its upper position towards the circuit card 11. A contact forms between the contact pins 14 on the circuit card 1 and the connection bridges 10 disposed on the switch package 3, when the switch arrangement remains in its closed ON state, in which an electrically conductive contact is formed. The locations of the parts of the main switch arrangement in the ON state are presented in Fig. 3.

[0031] In a fault current situation the actuator 12 activates from the effect of current coming from the summation current transformer of the residual current protection, in which case the part 13 projecting from the actuator 12 engages the protrusion 15 of the trip part 2, as is shown in Fig. 5, resulting in turning of the trip part 2 around the main shaft 1, whereby the counterpieces 18 of the trip part displace past the locking receptacles 17, into the state described in Fig. 8.3, allowing displacement of the main shaft 1, due to the return spring 8, back into its upper position. Simultaneously, the switch package 3 is displaced from the effect of the return spring 9 of the contact module back into its lower position bounded by the guide/motion limiters 16 of the switch package 3, and the trip part 2 in connection with the switch package 3 displaces into its armed position when the surfaces 19 guide the counterpieces 18 of the trip part 2 producing a rotational motion in the trip part 2 into the position described in Fig. 8.4. At the same time, via the displacement/rotational motion of the trip part 2, the protrusion 15 of the trip part 2 arms the actuator 12 back into the armed state, when the protrusion 15 pushes the shaft 13 that was pushed out of the actuator 12 back inside the actuator

12. The contact between the contact pins 14 on the circuit card 11 and the connection bridges 10 disposed on the switch package 3 opens, when the switch arrangement remains in its open OFF state.

5 **[0032]** Fig. 10 presents an explosion drawing of the parts of the main switch arrangement described above. The parts presented in Fig. 10 correspond to the parts presented in the earlier figures.

10 **[0033]** In one embodiment of the invention the main switch arrangement can also comprise a reset part 23, by means of which the switch arrangement can be made to trip without a residual current protection tripping situation. The reset part is arranged around the main shaft and is adapted to turn the main shaft 1. By means of the rotational motion exerted on the main shaft by the reset part 23, the locking receptacle 17 in the groove 22 situated in the main shaft 1 is adapted to detach from the locking counterpiece 18 situated in the trip part 2. The reset part is further adapted to release the spring force formed by the return spring 8, said spring force lifting the main shaft, and/or the spring force formed by the return spring 9 of the contact module in such a way that the contact module of the main switch in connection with the main shaft displaces into an electrically non-conductive state. The reset part can be arranged e.g. in such a way that, by means of a movement caused by an external force, a mechanical motion, e.g. a thrusting force coming from the switch 26, can be exerted, e.g. by means of a shaft, on the reset part 23, onto the protrusion 24, in which case the reset part starts to turn and at the same time produces a movement turning the main shaft 1. In one embodiment of the invention the main switch arrangement further comprises a spring integrated into the reset part 23 or arranged in connection with it, the spring being adapted to turn the main shaft, by means of the return movement of the reset part 23, back to its normal position after the external force exerted on the reset part ceases.

30 **[0034]** In one embodiment of the invention the trip part of the main switch arrangement can be made to trigger the switch arrangement without a triggering situation of the residual current protection. By means of this, residual current protection and/or an electrically conductive contact can be connected mechanically on and/or off. Fig. 9 presents the displacement of the trip part 2 of the main switch arrangement according to one embodiment of the invention from the armed state into its tripped state using a means independent of the fault current situation. In this solution, e.g. a means can be used with which a force exerted on the switch 25 is adapted to be conducted into the trip part 2. In the embodiment presented in Fig. 9 the means for conducting a force effect comprises a casing tube 21 and a moving part 20 arranged inside the casing pipe and movable in the direction of the pipe. In the solution of this embodiment, by means of a mechanical motion caused by an external force, the part 20 moving inside the casing tube 21 exerts a thrusting force on the protrusion 15 of the trip part 2, in which case the trip part turns around the main shaft 1 and the electrically con-

ductive contact breaks owing to the spring force formed by the return spring 8, said spring force lifting the main shaft, and/or the spring force formed by the return spring 9 of the contact module, said spring force displacing the contact module downwards.

[0035] It is obvious to the person skilled in the art that the different embodiments of the invention are not limited solely to the example described above, but that they may be varied within the scope of the claims presented below.

Claims

1. A main switch arrangement for a residual current safety switch, **characterized in that** the arrangement comprises:

- a main shaft (1) movable in the vertical direction and a trip part (2) arranged essentially around the main shaft, which trip part is adapted to turn around the main shaft,
- an actuator (12) and a summation current transformer connected electrically to it, which actuator (12) is arranged essentially in connection with the trip part (2),
- at least one return spring (8, 9), and
- a contact module,
- wherein the main shaft (1), trip part (2), return spring (8, 9) and actuator (12) are arranged in such a way that in a fault current situation a protrusion (13) projecting from the actuator is adapted to push the trip part (2) and to bring about a rotational motion in the trip part, and wherein the rotational motion of the trip part is further adapted to release the spring force formed by the return spring (8, 9), said spring force lifting the main shaft and/or lowering the contact module, in such a way that the contact module of the main switch in connection with the main shaft displaces into an electrically non-conductive state.

2. Arrangement according to claim 1, **characterized in that** the main shaft (1) comprises at least one groove (22), in which is a locking receptacle (17), which a locking counterpiece (18) in the trip part (2) is adapted to lock into when pressing the main shaft, in which case the arrangement is adapted to remain in a state in which the contact module of the main switch is in an electrically conductive state.

3. Arrangement according to claim 1 or 2, **characterized in that** the counterpiece (18) of the trip part is adapted to displace past the locking receptacle (17) when the locking part (2) moves around the main shaft (1) with a rotational motion and thus to release the spring force formed by the return spring (8), said spring force lifting the main shaft, and/or the spring

force formed by the return spring (9) of the contact module, said spring force lowering the contact module.

4. Arrangement according to any of the preceding claims, **characterized in that** the trip part (2) comprises a protrusion (15) and a trip part (13) and the actuator is arranged in such a way that when the actuator activates the protrusion (13) projecting from the actuator is adapted to engage the protrusion (15) of the trip part.

5. Arrangement according to any of the preceding claims, **characterized in that** the trip part (2) placed around the main shaft (1) of the main switch arrangement is adapted, in conjunction with tripping of the residual current protection, to return the actuator (12) after it has functioned in a fault current situation back into its armed state.

6. Arrangement according to claim 5, **characterized in that** the protrusion (15) of the trip part is adapted to function in a fault current situation as a part re-arming a reacting actuator (12), returning the protrusion (13) that has come out of the actuator (12) back into its armed state by means of a rotational motion of the trip part.

7. Arrangement according to any of the preceding claims, **characterized in that** the arrangement comprises a separate switch (25), which is arranged to displace the contact module of the main switch of the residual current protection into an electrically non-conductive state by means of the trip part (2) in such a way that the arrangement comprises means with which a force exerted on the switch (25) is adapted to be conducted into the trip part (2).

8. Arrangement according to any of the preceding claims, **characterized in that** the main switch arrangement is arranged on one or more circuit cards (11).

9. Arrangement according to any of the preceding claims, **characterized in that** the arrangement further comprises a structure, such as a frame part (4), preventing turning of the main shaft (1), the structure comprising a protrusion to be placed in a groove in the main shaft (1) or protrusions to be placed in grooves in the main shaft (1).

10. Arrangement according to any of the preceding claims, **characterized in that** the arrangement comprises at least two connecting strips (10) arranged into connection with the switch package (3) of the contact module.

11. Arrangement according to any of the preceding

claims, **characterized in that** the main shaft (1) comprises a locking cavity, which is arranged at the top end of the main shaft.

12. Arrangement according to claim 11, **characterized in that** the arrangement comprises an extension piece (6) fitted into the locking cavity. 5
13. Arrangement according to any of the preceding claims, **characterized in that** the main switch arrangement further comprises a reset part (23) arranged essentially around the main shaft, which reset part is adapted to turn the main shaft (1), by means of an external rotational motion exerted on the main shaft, in which case when the main shaft (1) turns, the locking receptacle (17) in the groove (22) situated in the main shaft (1) is adapted to detach from the locking counterpiece (18) situated in the trip part (2) and thus to release the spring force formed by the return spring (8), said spring force lifting the main shaft, and/or the spring force formed by the return spring (9) of the contact module, said spring force lowering the contact module in such a way that the contact module of the main switch in connection with the main shaft displaces into an electrically non-conductive state. 10
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14. Arrangement according to claim 1, **characterized in that** the main switch arrangement further comprises a spring in the reset part (23) or arranged in connection with it, the spring being adapted to turn the main shaft back into its normal position after the external force exerted on the main shaft (1) and/or on the reset part (23) ceases. 30
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15. Arrangement according to claim 13 or 14, **characterized in that** the main switch arrangement further comprises means, such as a shaft, for transmitting into the reset part motion caused by an external force, wherein a mechanical motion is adapted to be transmitted, e.g. a thrusting force coming from the switch (26), onto the protrusion (24) of the reset part (23), in which case the reset part starts to turn and at the same time produces a movement turning the main shaft (1). 40
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16. Arrangement according to any of the preceding claims, **characterized in that** the arrangement comprises a module return spring (9), which is adapted to displace the contact module of the main switch into an electrically non-conductive state by displacing the contact module into its lower position by means of the spring force of the return spring (9). 50
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Fig. 1

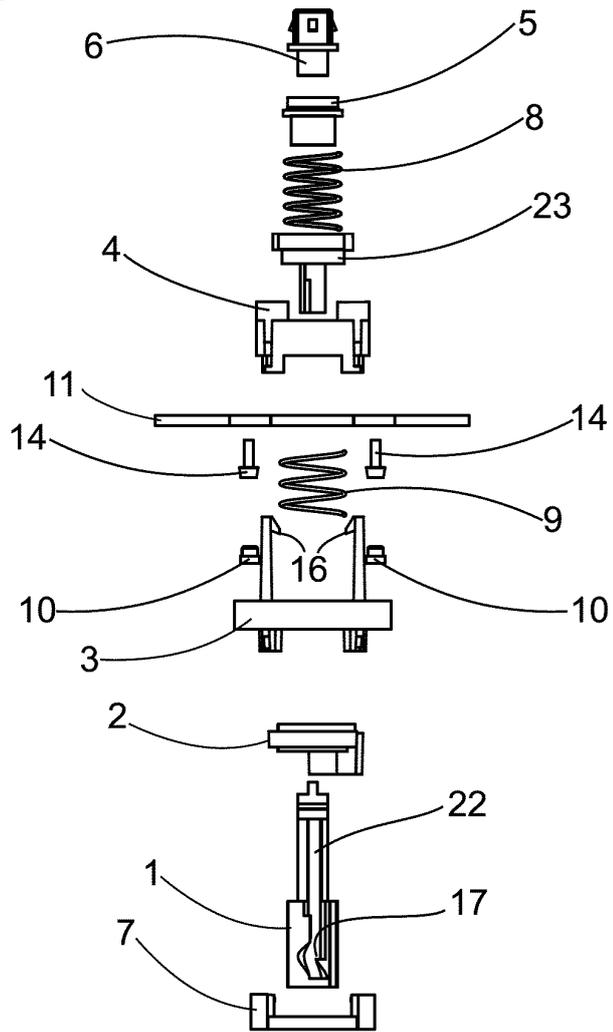


Fig. 2

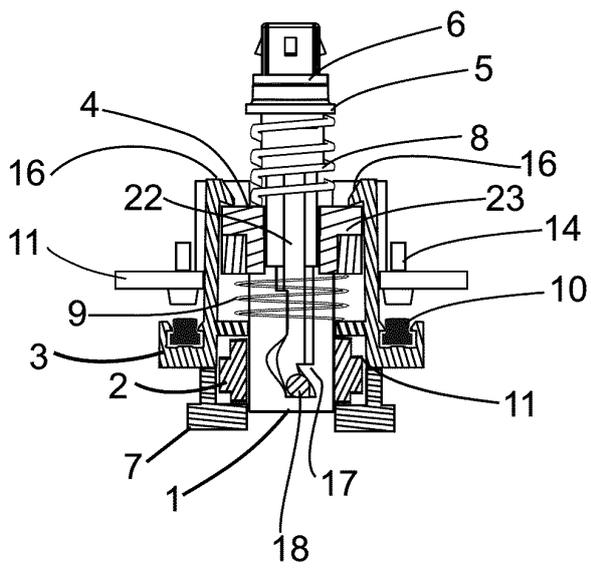
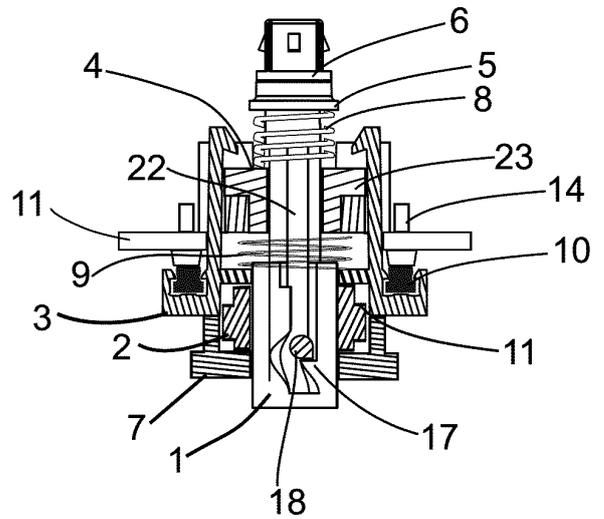


Fig. 3



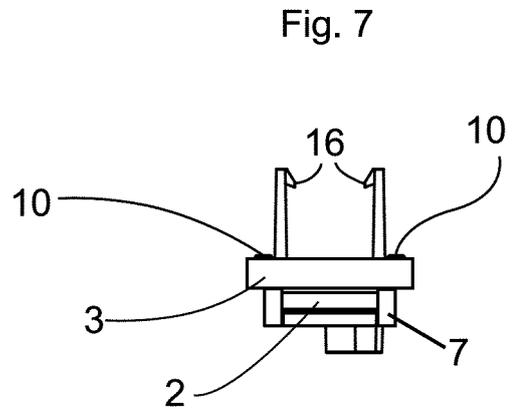
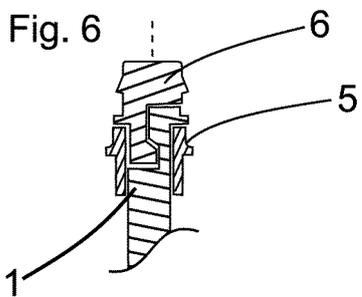
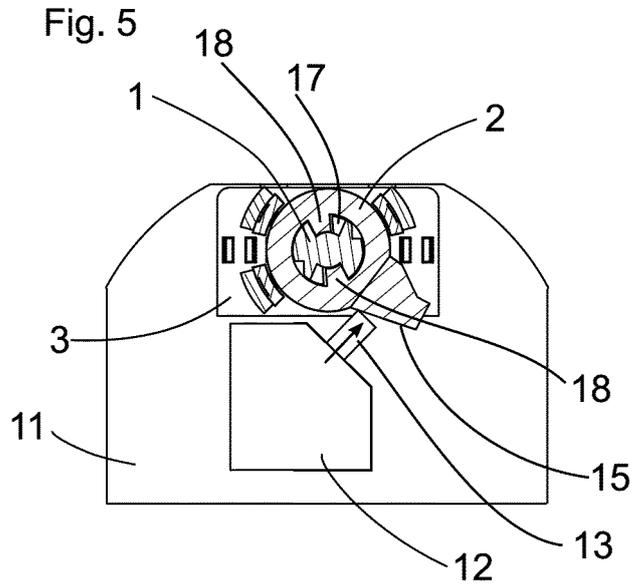
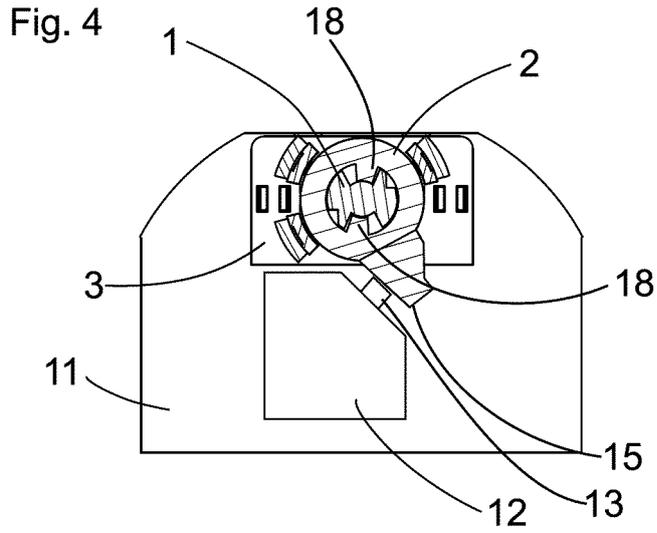


Fig. 8

Fig. 8.1

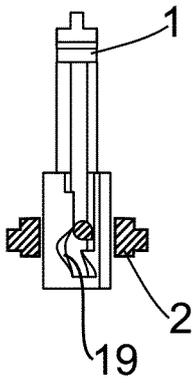


Fig. 8.2

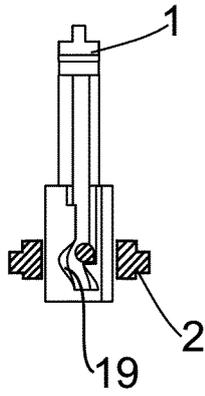


Fig. 8.3

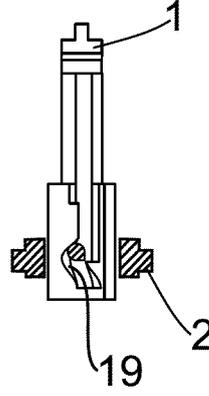


Fig. 8.4

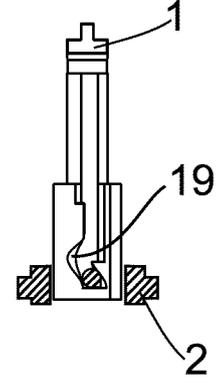


Fig. 9

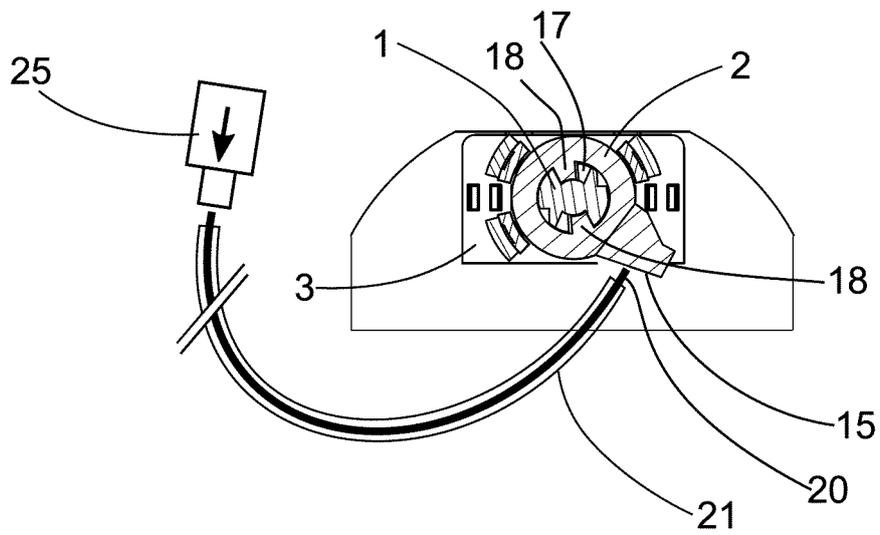
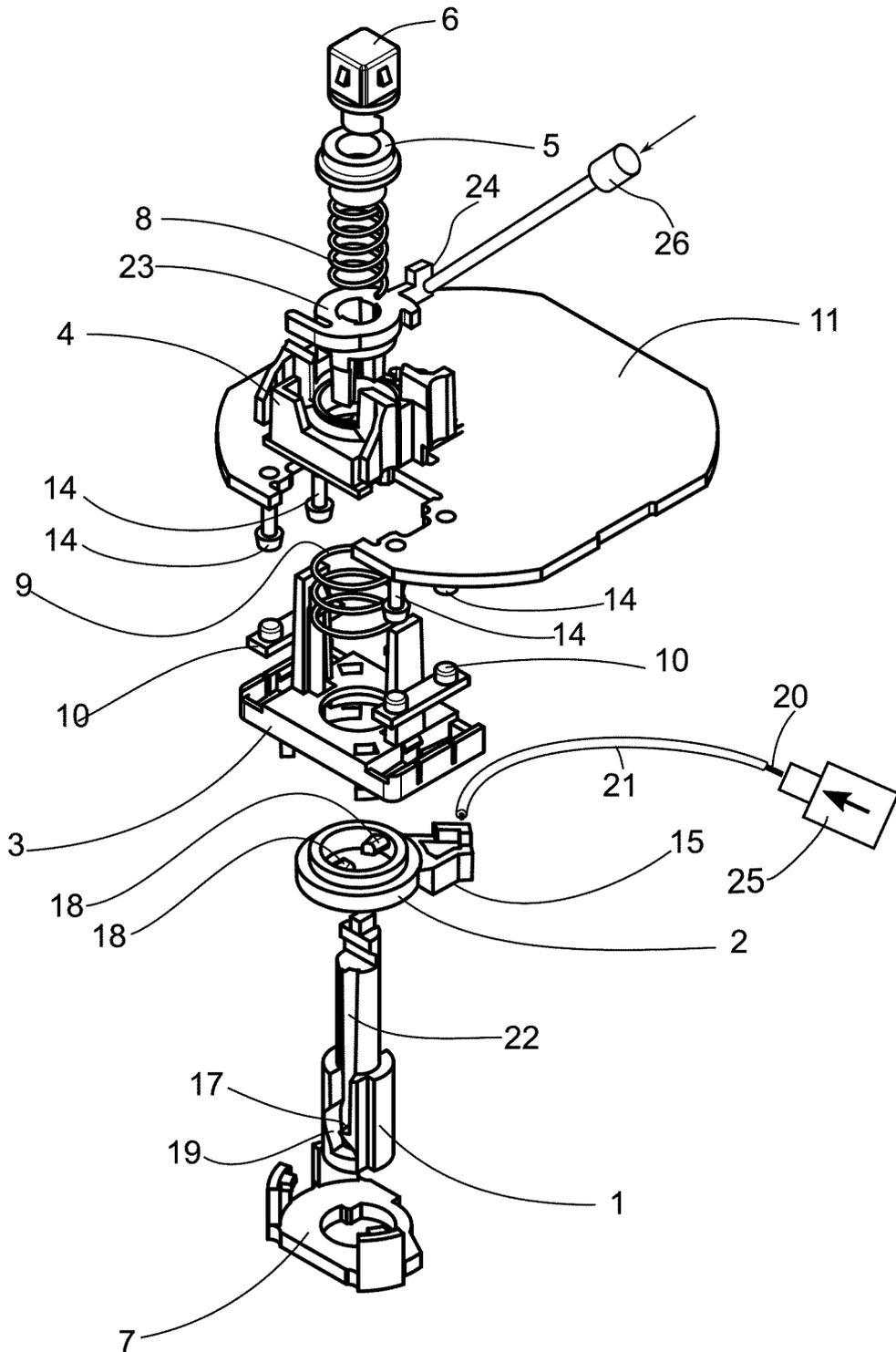


Fig. 10





EUROPEAN SEARCH REPORT

Application Number
EP 17 17 7315

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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	WO 2013/076377 A1 (ETHERMA SKANDINAVIA OY [FI]) 30 May 2013 (2013-05-30) * page 3, line 31 - page 4, line 15 * * figures 1-5 * -----	1-16	INV. H01H83/14 H01H71/50 ADD. H01H83/04
			TECHNICAL FIELDS SEARCHED (IPC)
			H01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 November 2017	Examiner Glaman, C
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 03/02 (P04C01)

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

EP 17 17 7315

5 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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16-11-2017

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
15	WO 2013076377 A1	30-05-2013	EP 2783382 A1 FI 20116178 A WO 2013076377 A1	01-10-2014 28-02-2013 30-05-2013
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82