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(54) **Device for automatically or manually testing of a protecting, controlling or signalling apparatus**

Einrichtung zum automatischen oder manuellen Testen eines Schutz-, Steuer- oder Meldegeräts

Dispositif de test automatique ou manuelle d'un appareil de protection, de commande ou de signalisation

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Description

PRIOR ART AND BRIEF DESCRIPTION OF THE INVENTION

[0001] The object of the present invention is a device which automatically or manually performs a screening of a protection device after prefixed whiles and may therefore work with any electric parameter, e.g. the current, the tension, or the homopolar current or any other quantity, even not an electric one, as long as it can go back to an electric quantity.

[0002] Electro-mechanical devices suitable for protecting plants, users and workers are well known. A working failure of said devices causes damages to the plant and is also dangerous for the safety of the persons. Therefore, a continuous check, or at least after regular whiles, of the working of said devices is important, as well as an automatical intervention when the device fails, by replacing it with another one or by cutting off the checked plant and/or by signalling the failure to the operator.

[0003] A device of known type for manually testing the efficiency of the failure detector means of an automatic differential circuit breaker, including a sliding body transmitting the motion from the failure detector means to the disconnecting mechanism of the breaker is described, for example, by EP-A-0 231 732.

[0004] Said type of device has the drawback that, in case of a test condition, the disconnecting mechanism is activated and moves the contacts of the main circuit in open position breaking the main circuit: the electrical apparatuses which are power supplied by the main circuit are therefore disconnected from the power supply.

[0005] As the users are (or could be) intolerant on the diadvantages coming from the disconnection of said electrical apparatuses from the power supply during the test, said test is (or could be) omitted frequently, affecting the safety of the users and of the electric plant.

[0006] The present description specifically refers to a checking device for residual current circuit breakers against contact voltages in order to protect human life; however, the principle and the embodiment are suitable, with obvious modifications, to a further protecting and adjusting device and also to a further regulating or signalling device.

[0007] The device object of the present invention deviates or stops the mechanical disconnecting chain for a little while (around one second) inside the protecting apparatus. Said mechanical disconnecting chain, starting from the electro-mechanical detector of the failure quantity (i. e. the relay), releases automatically or manually the hooking of the mechanism which normally activates the contacts.

[0008] In a particular embodiment during the short while in which the disconnecting chain is intentionally cut off, a cycle programming automatism (C.P.A.) having a prefixed cycle sends an electrical impulse to the electro-mechanical detector of the checked quantity (relay), which is as strong as the one to be emitted in case of a plant failure. If the system is in good working order said impulse causes the working of the relay by giving a signal which is sent to the C.P.A. and which confirms that all is in order.

[0009] As a consequence of that, the C.P.A. sets in motion again the mechanical disconnecting chain previously cut off. Otherwise, if the relay does not work, the C.P.A. does not receive the back signal and, regarding this fact as a failure, it produces a signal.

[0010] Said first embodiment of the present invention comprises:

A) a C.P.A. performing the aforesaid cycle according to a well-known technique; said cycle could be mechanical, electrical, electronic, hydraulic or pneumatic or a suitable combination of these techniques;

B) one or more actuators produced by means of a well-known technique, carrying out the orders given by the C.P.A. and which are disclosed in the description as little electro-magnets;

C) an embodiment of the system which deviates or cuts off for a reduced while the order flow from the relay to the disconnecting chain of the device. Said system may be differently carried out, according to the energy used (i.e. electro-mechanical, magnetic, mechanical, pneumatic, oleodynamic) or by means of a combination of two or more different kinds of energy.

All the above described functions are ruled by an automatism (cycle-programming) and carried out by electro-magnets (or equivalent means) guided by the aforesaid C.P.A..

Aim of a third embodiment of the present invention is to show an accomplishment of the same function, no longer by means of a programmed automatism, but by means of a manual switching on carried out by the user.

This latter accomplishment is easier and cheaper, especially with regard to the residual current circuit breakers. According to the rules, said breakers must be provided with a manual button which, by simulating a current failure towards earth, provokes the click of the breaker and then an interruption of the electrical supply, thus disturbing the user and damaging the plant.

Hereinafter three non-limiting electro-mechanical embodiments are described which could be easily used by employing a kind of energy different from the mechanical one.

It is also possible to employ the first two electro-mechanical embodiments according to the free space available inside the protecting device:

D) with no free space inside the protecting device: it is possible to effect the cutting off of the disconnecting chain by acting on at least a lever which

links the acting point of the relay pusher to the hooking point of the click mechanism of the contacts;
E) with free space inside the protecting device: it is possible to cause the shifting or the rotation of the whole body of the disconnecting device in order to reach a new position where the thrust pin does not interfere with the mechanical disconnecting chain of the protecting device.

SUMMARY OF THE INVENTION

[0011] The present invention refers to a device for automatically or manually testing the efficiency of the most sensitive components of an electrical apparatus, in particular of a residual circuit breaker, keeping the contacts of the main circuit in normal working order also in case of a test condition and comprising a lever which transmits the motion from the pusher of a relay belonging to the electrical apparatus to hooking means stopping the disconnecting mechanism of the breaker.

[0012] According to the present invention, the lever is doubled in two half-levers, the pusher acts on a first of the two half-levers and the device includes means for automatically or manually injecting a simulated current of failure provoking the intervention of the apparatus under test; in case of a test condition the first half-lever is disconnected from the second half-lever to prevent the transmission of the motion from the pusher to the hooking means, while in case of normal working condition the two half-levers are integrally connected each other.

LIST OF THE FIGURES

[0013]

- Figure 1 shows an electro-magnetic disconnecting device placed in a protecting device;
- Figure 2 shows a first embodiment of the present invention automatically checked by a C.P.A., when no free space is available inside the protecting device;
- Figure 3 is a horizontal section A-A along an axis of the first embodiment shown in figure 2;
- Figure 4 shows a flow-chart of the C.P.A., which represents a well-known technique;
- Figure 5 shows a second embodiment of the device according to the present invention, in that case a free space is available inside the apparatus;
- Figure 6 represents a third embodiment of the device according to the present invention, which manually works;
- Figure 7 represents the electical working of the embodiment shown in figure 6.

DETAILED DESCRIPTION OF THE INVENTION

[0014] Figure 1 shows, inside an electrical protecting device, the part where the polarised relay 10 is placed; said relay 10 fixed to stand 12 has a pusher 11. The disconnecting lever 13, being able to rotate around axis 14, rotates by means of pusher 11 when the relay 10 is energized owing to a plant failure, said pusher 11 pushing point 15 of the aforesaid lever 13. By means of tip 16 this latter disconnects hooking means 17 which switches on the whole disconnecting apparatus 18.

[0015] This working is usual in most of the mechanical protecting devices and it will be modified as follows according to the present invention.

[0016] Figure 2 shows a first embodiment of the present invention automatically checked by a C.P.A., when no free space is available inside the protecting device.

[0017] As shown in figure 2 the lever 13 of figure 1 is split into two half-levers 20, 21 hinged on the same axis 14, being said two half-levers 20, 21 integral to each other during the normal service working as only one lever 13 previously described. In figure 2, which is an exploded view, and in figure 3, which is a horizontal section A-A along the centre line of axis 14, one of said half-levers 20, 21, e.g. half-lever 20, is integrally fixed to axis 14 by means of two suitable stops 22, 23; when axis 14 shifts forward and backward it trails half-lever 20, whereas half-lever 21 stops because of bush 24 which binds said half-lever 21 to stand 12.

[0018] According to this particular feature, or an equivalent one, when the C.P.A. (not shown in figure 2) decides to verify the working of the device, it switches on the electro-magnet 25 which attracts core 26. In that case, axis 14 shifts trailing half-lever 20, whereas half-lever 21 stops.

[0019] In this way tailpiece 27 of half-lever 20, which up to this point engaged half-lever 21 making it integral to said half-lever 20 during its possible clockwise rotation, is placed in correspondence to free space 28 of half-lever 21; in this position the two half-levers 20, 21 are now free. At this moment the C.P.A. sends an impulse to the relay 10, said impulse being as strong as the one produced by a failure in the plant with a consequent coming out of pusher 11 which causes a counter-clockwise rotation of half-lever 20, whereas half-lever 21 and hooking means 17 (not represented in Figs. 2-3) stop and then stops also the main mechanism which operates the network contacts. During its rotation half-lever 20 operates a suitable contact 29 by means of its arm 30, said contact 29 being represented in figure 2 as a mechanical one, but may be reed-type or static ones. A signal is generated and sent to the C.P.A. causing the excitement of a second electro-magnet 31 which provokes, by means of spring 32, a counter-rotation of half-lever 20 with its slide 33 towards the starting position and further, in order to make sure that through the aforesaid half-lever 20 also pusher 11 of the relay 10 reaches its starting point. Afterwards, the C.P.A. provides to de-energize the electro-magnet 25 and then subsequently electro-magnet 31, so that half-lever 20 goes exactly back to the starting point by means of reaction springs

34, 35. After checking the efficiency of the differential trasformer, of the failure detector (relay) and of the first operating unit of the disconnecting apparatus, the C.P.A. resets and starts a new delay cycle, at the end of which it checks again and so on, till when, during such an automatic check, it happens that the relay 10, although energized by means of a test impulse, does not activate pusher 11. It is obvious that the protecting apparatus fails because the relay is no longer efficient or because the mechanical frictions have increased, or because oxidation or corrosion occurs, or because the anchor of the magnetic circuit of the relay 10 adheres, etc.

[0020] Because of the failed action of pusher 11, half-lever 20 does not rotate and contact 29 does not switch on. The C.P.A. takes note of this, and, as above said, stops, thus activating the means foreseen by the procedure in case of failure, said means being respectively:

- the replacement of the failed apparatus with a spare one by automatically acting suitable switches of the electrical network, besides the activation of a signal;
- the immediate remote switching off of a main circuit breaker placed before the failed apparatus, besides the activation of a suitable signal in situ or far away;
- the simple activation of a suitable signal in order to require the immediate presence of a technician.

[0021] Figure 2 shows a particular embodiment of two half-levers 20 and 21, linked by means of any mechanical device, e.g. a pin or a lock placed in suitable bores on parallel side walls of half-levers 20 and 21. The placement of said pin corresponds to the normal working of the device, whereas the extraction of said pin by means of an electro-magnet commanded by the C.P.A. makes the two half-levers 20 and 21 free to indipendently move. The aforesaid linkage could be carried out by means of any other device, electro-magnetic (e.g. an electromagnetical coupling), magnetic (e.g. one or more permanent magnets suitably disposed by an external operator), hydraulic or pneumatical (e.g. by means of a little pinion commanded by an electro-valve), the working of said means being always controlled by the C.P.A..

[0022] The practical application of the device suitable to the apparatus which does not provide a free space is advantageous when the apparatus is a modular one, namely:

- C.P.A. (very small if completely electronic);
- two electro-magnets 25 and 31 with relevant working levers, slide 33 and core 26;
- contact 29;
- the optical signal device in situ;
- the contact sending said signal, and
- the source for the whole device, which is fed below the protecting apparatus to be controlled,

may be contained in one module to add by a simple assembling operation to the modular protecting apparatus, if it has already programmed to this aim.

[0023] In fact, this latter must have already been provided during its construction with:

- two split half-levers 20 and 21, wherein half-lever 20 and the relevant axis 14 can freely shift;
- interfacing end elements 36 and 37 destined to energize the relay 10, which have derived, in the case of residual current circuit breakers or relays, from the electrical test button with suitably limited current, which the C.P.A. will afterwards act in order to inject an impulse into transformer 38 whose secondary circuit feeds winding 39 of the relay 10; as well as
- preconstituted cavities placed on the container wall of the apparatus, on the same side of stand 40, where it can be subsequently added the aforesaid self-checking module, after the removal of the cut parts for the preconstituted cavities which allow the penetration of the following parts, projecting out of the self-checking module:
- core 26 acted by electro-magnet 25 in order to move axis 14 and press spring 34;
- slide 33 acted by electro-magnet 31 which drives the counter-clockwise rotation of half-lever 20 and which also bears contact 29;
- the connector to be plugged into end elements 36 and 37.

[0024] For a better comprehension of the present description figure 4 shows a flow-chart of the C.P.A., which in its turn represents a well-known technique, namely:

- Nr. 40: is the starting step for the counting between two checks;
- Nr. 41: continues the counting;
- Nr. 42: discerns two different cases: (a) if the counting does not come to an end for lack of tension to the C.P.A. (e.g. because the breakes has been manually switched) he cycle resets and then starts again; (b) on the contrary, if the counting ends, it follows Nr. 43 wherein electro-magnet 25 moving axis 14 is energized;
- Nr. 44: end elements 36 and 37 are short-circuited with a consequent feeding of transformer 38, of relay 10 and a final switching on of contact 29;
- Nr. 45: the switching on of contact 29 allows the cycle prosecution; on the contrary, its possible failure provokes the C.P.A. stop and the transmission of the signals for the emergency procedure (alarms, etc) (Nr. 50);
- Nr. 46: removes the short-circuit between end terminals 36 and 37;
- Nr. 47: energizes electro-magnet 31 which leads half-lever 20 to its starting point and loads again disconnecting device 10;
- Nr. 48: sequentially de-energizes electro-magnets 25 and 31;

- Nr. 49: resets the counting thus allowing the cycle to start again with Nr. 40.

[0025] The check of a regular working can be effected in a very short while (around 2 seconds). The lapse between two checks may vary from some seconds to one month, according to the apparatus, its functions and its requirements.

[0026] Figure 5 shows a second embodiment of the device according to the present invention. In that case a free space is available inside the apparatus and it is necessary an alteration to the normal mechanism of figure 1. Remark that the relay 10 is fixed on one side to the axis 51 around which it could rotate, were it not stopped by spring 52. If, on the contrary, the external electro-magnet 53 is energized when the C.P.A. decides to start the periodical check, the relay 10 is called back by the anchor of electro-magnet 53 through tie 54 and rotates around axis 51 thus pushing pusher 11 outside the field of action of arm 55 of disconnecting lever 13. If, in this new position, the relay 10 is energized by means of the C.P.A., pusher 11 engages lever 56 by making it rotate around axis 57 with an angle sufficient to set in motion a contact, both a metallic contact 58 or a static one.

[0027] The consent signal reported by contact 58 to the C.P.A. starts the following step which consists of loading lever 56 by energizing electro-magnet 59 which swallows up its mobile core and of re-starting the protection by ordering the de-energization of electro-magnet 53 which makes come back the relay 10 to its starting position. On the contrary, if pusher 11 had not come out when the C.P.A. had sent the electric impulse to the disconnecting device 10, lever 56 would have not rotate and contact 58 would have not switched on. Receiving no signal, the C.P.A. would have stopped and would have started the foreseen emergency measures.

[0028] If provided with elementary alterations and adjustments the showed embodiment is valid in all cases, namely if the relay 10 does not rotate, but shifts or is lifted, if its motion is a combined rotation and shifting or if the relay is definite while the disconnecting chain partly rotates or shifts.

[0029] The third embodiment of the present invention, which manually works, is described as follows with a particular reference to a residual current circuit breaker; however, with obvious adjustments, this system can also apply to other electrical apparatuses to keep under control. The test button releases a half-lever thus verifying the detecting and disconnecting function (differential transformer, relay and disconnecting chain) without interrupting the supply, as hereinafter described with reference to figures 6 and 7.

[0030] In said two figures the button is marked with 60. The button upper part 61 protruding out of the breaker carter is pushed by the user. Letter T 62 graved on said button upper part 61 is prescribed by the rules and means "test". 63 and 64 are two button side wings, which, shifting along the two fixed grooves of the switch, lead the button in its shifting downwards. The button cylindrical lower part 66, which can shift inside the sleeve 67, integral to the breaker, guides the reaction spring 68. In figures 6 and 7 it is also remarkable the presence of the wall 40 supporting the switch mechanism, particularly axis 14 of half-lever 20, free to rotate but integral to said switch mechanism by means of two stops 22, 23.

[0031] As above said, axis 14 shifts rightwards by means of an external action on its left end and comes back to its starting position thanks to spring 34.

[0032] Figure 6 shows as the pressure on the button shifts the aforesaid axis 14. In fact, on wall 40 the bent part 69 is to be noticed, to which the fixed axis 70 is integral; the free lever 71 is hinged on said axis 70, said lever being frictionally pressed by spring 72 and stop 73. The upper end of lever 71 can be placed by the user either on the free space 74, comprised in the main body of the switch corresponding to: "Check without switch click", or on the contiguous space 75, corresponding to "Check with switch click".

[0033] In fact, the lower end of lever 71 is provided with a tailpiece 76 compelling cam 77 (free to rotate on axis 93 integral to button 60), to stop in the position indicated in figure 6, when lever 71 is placed in the free space 74.

[0034] By pushing the button, the right side of cam 77 engages the end of axis 14 and pushes it rightwards, thus shifting half-lever 20 and its tailpiece 78 bent downwards. Arm 79 is integral to button 60 and it is therefore shifted downwards in the opening 80. The end 81 of arm 79 will then have the same vertical position of tailpiece 78, but below it. Supposing that the relay 10 of figures 1 and 2 has been energized by the actions hereinafter described, the pusher 11 rotates half-lever 20 downwards. If the user releases button 60, it will come back upwards because of spring 68. Then also arm 79 and its end 81 will come back to their starting position thus leading upwards also half-lever 20 which will press on the pusher 11 re-energizing the relay 10. The end 81 has a springy tailpiece 82, on which the lower end of tailpiece 78 shifts when axis 14, because of spring 34, brings back half-lever 20 to its usual rest position, namely integral to lever 21, cam 77 being come back to the position of figure 6.

[0035] The electrical functions performed by button 60 in the meanwhile are reported in figure 7, which shows said button 60 rotated 90° counter-clockwise in order to clear up said functions.

[0036] Figure 7, beside the parts already described in figure 6 with the same references, shows that:

- a sensitive contact 83, 84 which can be differently carried out, e.g. statically by means of a photodiode, moved by arm 30 of half-lever 20;
- a metallic conducting plate 85, immerged in the isolating button 60, which, when it is engaged with sliding brushes 86, 87, 88 closes the relevant electrical

circuits;

- a signalling lamp 89 with relative ballast 90;
- the differential transformer 38 with its relevant secondary winding 39 feeding the relay 10;
- a resistor 91 limiting the current flowing in the primary spoil of transformer 38.

[0037] By pushing button 60, beside the aforementioned mechanical functions, the following electrical actions occur:

- first, plate 85 engages sliding brushes 86, 87, thus linking the feeding circuit 92 to a circuit composed by the following parts: the aforesaid sliding brushes 86, 87, lamp 89 with its relevant resistor 90, sensitive contacts 83, 84 now already open;
- then, plate 85 also touches sliding brush 88 thus switching on also the circuit composed by: feeding circuit 92, sliding brushes 86, 87, 88, primary winding of transformer 38, resistor 91 limiting the test current of the breaker.

[0038] Said test current generates a current in the secondary winding 39 of transformer 38 which energizes the relay 10 and draws out pusher 11 of figure 2, thus rotating counter-clockwise lever 20, which, in the meantime, had been shifted rightwards by axis 14 pushed in its turn by cam 77 of figure 6, and is released from half-lever 21. Arm 30 of half-lever 20 switches on contacts 83, 84 which, in their turn, switch on the circuit of lamp 89 which lights up, thus confirming to the user that the differential transformer, the relay and the first half-lever work correctly.

[0039] When the user releases the button, together with the above described mechanical actions for the restoration of half-lever 20, all electrical circuits come to their starting "switched off" position. In this way the manual check of the most sensitive components takes place without interrupting the electrical supply. Together or apart from the present invention, the breaker could also be provided with a timer programmed with delays corresponding to one month, or to a different lapse of time in case of particular necessities; at the expiry of the programmed time said timer lights up a visual signal, or an acustic one, which indicates to the user that he must press the test button.

[0040] If the user wishes to check all functions of the switch, he just has to move lever 71 from position 74 to position 75. In this case, in fact, the tailpiece 76 of lever 71 goes away from cam 77 which, during the pressure of the finger on button 60 shifts to the end of axis 14 without moving it and then leaving the two half-levers 20, 21 integral to each other.

[0041] In this case, by moving downwards and closing the contacts 86 and 88 button 60 starts the relay 10 which rotates both half-levers 20 and 21, thus provoking the disconnecting of the whole mechanism and the following switching on of the breaker, whereas lamp 89 does not light up because arm 30 of the half-lever 20, which has not moved, does not engage the contact 84. It is also to be noticed that the particular shape of plate 85 provokes only a temporarily switching on of contact 88 which feeds transformer 38 so that the limiting resistor 91 is not damaged if the user presses the test button for a long time.

Claims

1. Device to automatically or manually test the efficiency of the most sensitive components of an electrical apparatus, in particular of a residual circuit breaker, keeping the contacts of the main circuit in normal working order also in case of a test condition and comprising a lever which transmits the motion from the pusher of a relay belonging to the electrical apparatus to hooking means stopping the disconnecting mechanism of the breaker; said device being characterised in that said lever (13) is doubled in two half-levers (20, 21); in that said pusher (11) acts on a first (20) of said two half-levers (20, 21); in that said device includes means for automatically or manually injecting a simulated current of failure provoking the intervention of the apparatus under test; and in that in case of a test condition said first half-lever (20) is disconnected from the second half-lever (21) to prevent the transmission of the motion from said pusher (11) to said hooking means (17), while in case of normal working condition said half-levers (20, 21) are integrally connected each other.

2. Device according to claim 1, characterized in that said lever (13) is doubled in two half-levers (20, 21) hinged on the same axis (14) but having two possible mutual positions:

   (a) a first position, corresponding to the normal working order, without the action of external agents, wherein said two half-levers (20, 21) are integral to each other, thus forming a single lever, which can rotate releasing the disconnecting mechanism and commanding the switching off of the switch;
   (b) a second position of said two half-levers (20, 21), being caused by the action of external agents when the interruption of the click mechanism is wished, said second position being obtained by shifting the axis (14) of said two half-levers (20, 21) , so that the dragging half-lever (20) shifts integrally with said axis (14) because of two stops (22, 23) on said axis (14), whereas the dragged half-lever (21) stops because it is linked to the stand (12) and is free regarding the axis (14); thanks to the shifting of said axis (14), the tailpiece (27) of the dragging half-lever is located inside a free space (28) of the

dragged half-lever (21) and then, during the test, the pusher (11) of the relay may freely rotate said half-lever (20) till switching on a contact (29) which confirms that the protection system is efficient, while the other half-lever (21) and the hooking mechanism are still.

3. Device according to claim 1, characterized in that the link between said two half-levers (20, 21) is performed by means of a pin or a lock introduced in suitable bores placed on side walls of said two half-levers which may become independent from each other only when an external agent, like an electromagnet, removes said pin or lock from at least one of said half-levers.

4. Device according to claim 1, characterized in that said two half-levers (20, 21) are integral to each other through magnetic means.

5. Device according to claim 1, characterized in that said two half-levers (20, 21) are integral to each other during the normal working order, whereas during the test they become independent from each other by means of hydraulic or pneumatical devices applied to said half-levers and externally guided.

6. Device according to claim 1, characterized in that the interruption of the disconnecting chain is obtained by rotating, or shifting, or both, the relay (10) by means of an external device (52, 53, 54), so that said relay (10) reaches during the test a different position wherein the pusher (11) of the relay (10) acts a lever (56) in order to switch on the contact (58) confirming the protection efficiency.

7. Device according to claim 2, characterized by consisting of a button (60) to be externally manually pressed which, beside the electrical contacts necessary to inject a simulated current of failure provoking the intervention of the apparatus under control, supports a cam (77) apt to shift an axis (14) which, in its turn, shifts a half-lever (20) free to rotate on said axis (14) and which, after this shifting, looses its link to a second half-lever (21).

8. Device according to claim 7, characterized in that the cam (77) provoking the shifting of the axis (14) on which both half-levers (20, 21) rotate is blocked in its position relevant to the button (60) by a lever (71) hinged on the fixed part of the apparatus which, sliding on a side of said cam (77), links it to its position even when the pressed button (60) shifts, said lever (71) having two stable positions, one being the above mentioned and the other being rotated with any angle with respect to the first which detaches it from said cam (77) and then does not link it any longer, so that the button (60) can perform any other function, but the one the cam (77) is committed to.

9. Device according to claim 7, characterized in that it is provided with simple means to subsequently act two electrical circuits, the one being the circuit of a signalling lamp (89), and the other apt to simulate a failure current, said circuits being synchronized with the mechanical actions previously described.

10. Device according to the previous claims 7, 8, 9, characterized in that the button (60) is replaced by any other actuator (e.g. lever or rotating knob) and, anyway, carried out and acted.

Patentansprüche

1. Einrichtung zum automatischen oder manuellen Testen der Leistungsfähigkeit der empfindlichsten Komponenten eines elektrischen Geräts, insbesondere eines Reststrom-Stromkreisabschalters, die die Kontakte des Hauptstromkreises auch im Falle einer Testbedingung im Normalbetriebszustand hält und einen Hebel umfaßt, der die Bewegung des Stößels eines zum elektrischen Gerät gehörenden Relais auf Einhakmittel überträgt, die den Abschaltmechanismus des Abschalters sperren,
wobei diese Einrichtung dadurch gekennzeichnet ist,
daß der Hebel (13) in Form zweier Halbhebel (20, 21) doppelt ausgelegt ist; daß der Stößel (11) auf einen ersten (20) der beiden Halbhebel (20, 21) einwirkt; daß die Einrichtung Mittel zum automatischen oder manuellen Injizieren eines simulierten Fehlerstroms enthält, der die Operation des Geräts unter Test veranlaßt; und daß im Falle einer Testbedingung der erste Halbhebel (20) vom zweiten Halbhebel (21) getrennt wird, um die Übertragung der Bewegung vom Stößel (11) zum Einhakmittel (17) zu verhindern, wogegen im Falle der Normalbetriebsbedingung die Halbhebel (20, 21) miteinander vollständig verbunden sind.

2. Einrichtung nach Anspruch 1,
dadurch gekennzeichnet,
daß der Hebel (13) in Form zweier Halbhebel (20, 21) doppelt ausgelegt ist, die an der gleichen Achse (14) schwenkbar angebracht sind, jedoch zwei mögliche gegenseitige Positionen haben:

(a) eine erste Position, die dem Normalbetriebszustand ohne Einwirkung äußerer Wirkkräfte entspricht, wobei die beiden Halbhebel (20, 21) miteinander vereint sind und somit einen einzigen Hebel bilden, der drehen kann, wobei der Abschaltmechanismus freigegeben und das Abschalten des Schalters gesteuert wird;

(b) eine zweite Position der beiden Halbhebel (20, 21), die durch die Einwirkung äußerer Wirkkräfte verursacht wird, wenn die Unterbrechung des Sperrmechanismus erwünscht ist, wobei die zweite Position durch Verschieben der Achse (14) der beiden Halbhebel (20, 21) erhalten wird, so daß sich der ziehende Halbhebel (20) vollständig mit der Achse (14) wegen zweier Anschläge (22, 23) an dieser Achse (14) verschiebt, wohingegen der gezogene Halbhebel (21) stehenbleibt, weil er mit dem Gestell (12) verbunden ist und hinsichtlich der Achse (14) frei ist; aufgrund der Verschiebung der Achse (14) ist das Endstück (27) des ziehenden Halbhebels innerhalb eines freien Raumes (28) des gezogenen Halbhebels (21) und dann, während des Tests, kann der Stößel (11) des Relais diesen Halbhebel (20) frei drehen, bis ein Kontakt (29) eingeschaltet wird, der bestätigt, daß das Schutzsystem leistungsfähig ist, wogegen der andere Halbhebel (21) und der Einhakmechanismus im Stillstand sind.

3. Einrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Verbindung zwischen den beiden Halbhebeln (20, 21) mittels einer Nadel oder eines Riegels ausgeführt ist, die/der in passende Bohrungen eingeführt ist, die an Seitenwänden der beiden Halbhebel angeordnet sind, die nur dann voneinander unabhängig werden können, wenn eine äußere Wirkkraft, wie ein Elektromagnet, die Nadel oder den Riegel von wenigstens einem der Halbhebel entfernt.

4. Einrichtung nach Anspruch 1, dadurch gekennzeichnet, daß zwei Halbhebel (20, 21) miteinander über magnetische Mittel vereint sind.

5. Einrichtung nach Anspruch 1, dadurch gekennzeichnet, daß zwei Halbhebel (20, 21) während des Normalbetriebszustands miteinander vereint sind, wogegen sie während des Tests mittels hydraulischer oder pneumatischer Einrichtungen, die bei den Halbhebeln angebracht und extern geführt werden, voneinander unabhängig werden.

6. Einrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Unterbrechung der Abschaltkette durch Drehung oder/und Verschiebung des Relais (10) mittels einer externen Einrichtung (52, 53, 54) erhalten wird, so daß das Relais (10) während des Tests eine unterschiedliche Position erreicht, in der der Stößel (11) des Relais (10) einen Hebel (56) betätigt, um den Kontakt (58) einzuschalten, der die Schutzwirksamkeit bestätigt.

7. Einrichtung nach Anspruch 2, gekennzeichnet durch die Zusammensetzung aus einem von außen manuell zu drükkenden Knopf (60), der außer den elektrischen Kontakten, die zum Injizieren eines simulierten, die Operation des Geräts bei Kontrolle veranlassenden Fehlerstroms nötig sind, einen Nocken (77) trägt, der geeignet ist, eine Achse (14) zu verschieben, die ihrerseits einen Halbhebel (20) zur Drehung an dieser Achse (14) freischiebt und die nach dieser Verschiebung ihre Verbindung zu einem zweiten Halbhebel (21) verliert.

8. Einrichtung nach Anspruch 7, dadurch gekennzeichnet, daß der Nocken (77), der die Verschiebung der Achse (14) veranlaßt, an der beide Halbhebel (20, 21) drehen, in seiner für den Knopf (60) relevanten Position durch einen am festen Teil des Gerätes schwenkbar gelagerten Hebel (71) verriegelt ist, der unter Gleiten an einer Seite des Nockens (77) ihn in seiner Position bindet, sogar wenn sich der gedrückte Knopf (60) verschiebt, wobei der erwähnte Hebel (71) zwei stabile Positionen hat, von denen die eine die vorher erwähnte ist und die andere in bezug auf die erste um einen beliebigen Winkel gedreht ist, der ihn vom Nocken (77) löst und ihn dann nicht länger verbindet, so daß der Knopf (60) jede beliebige andere Funktion ausführen kann, außer derjenigen, welche der Nocken (77) zu verrichten hat.

9. Einrichtung nach Anspruch 7, dadurch gekennzeichnet, daß sie mit einfachen Mitteln versehen ist, um aufeinanderfolgend zwei elektrische Stromkreise zu betätigen, wobei der eine der Stromkreis einer Signalisierungslampe (89) ist und der andere geeignet ist, einen Fehlerstrom zu simulieren, wobei die Stromkreise mit den vorher beschriebenen mechanischen Vorgängen synchronisiert sind.

10. Einrichtung nach den vorhergehenden Ansprüchen 7, 8, 9, dadurch gekennzeichnet, daß der Knopf (60) durch ein beliebiges anderes Stellglied (z.B. Hebel oder Drehknopf) ersetzt ist und auf irgendeine Weise ausgeführt und betätigt wird.

Revendications

1. Dispositif pour tester automatiquement ou manuellement l'efficacité des composants les plus sensibles d'un appareil électrique, en particulier d'un dis-

joncteur résiduel, qui maintient les contacts du circuit principal en ordre de fonctionnement normal également dans le cas d'une situation de test et comprend un levier qui transmet le mouvement du poussoir d'un relais appartenant à l'appareil électrique à des moyens d'accrochage arrêtant le mécanisme de coupure du disjoncteur ; ledit dispositif étant caractérisé en ce que ledit levier (13) est dédoublé en deux demi-leviers (20,21) ; en ce que ledit poussoir (11) agit sur un premier (20) desdits deux demi-leviers (20,21) ; en ce que ledit dispositif comprend des moyens pour injecter automatiquement ou manuellement un courant de défaut simulé provoquant l'intervention de l'appareil sous test ; et en ce que,dans le cas d'une situation de test, ledit premier demi-levier (20) est désaccouplé du deuxième demi-levier (21) pour empêcher la transmission du mouvement dudit poussoir (11) auxdits moyens d'accrochage (17) tandis que, dans le cas d'une situation de fonctionnement normal, lesdits demi-leviers (20,21) sont solidairement reliés l'un à l'autre.

2. Dispositif selon la revendication 1, caractérisé en ce que ledit levier (13) est dédoublé en deux demi-leviers (20,21) qui pivotent sur le même axe (14) mais qui ont deux positions mutuelles possibles :

(a) une première position, correspondant à l'ordre de fonctionnement normal, sans l'action d'agents extérieurs, dans laquelle lesdits deux demi-leviers (20,21) sont solidaires l'un de l'autre, pour former ainsi un levier unique qui peut tourner pour libérer le mécanisme de coupure et commander l'ouverture du contact ;
(b) une deuxième position desdits deux demi-leviers (20,21) déterminée par l'action d'agents extérieurs lorsque l'interruption du mécanisme de déclic est désirée, ladite deuxième position étant obtenue par déplacement de l'axe (14) desdits deux demi-leviers (20,21) de sorte que le demi-levier d'entraînement (20) se déplace solidairement avec ledit axe (14) du fait de deux butées (22,23) prévues sur ledit axe (14), tandis que le demi-levier entraîné (21) est arrêté du fait de sa liaison au support fixe (12) et il est libre par rapport à l'axe (14) ; en raison du déplacement dudit axe (14), la queue (27) du demi-levier d'entraînement se trouve à l'intérieur d'un espace libre (28) du demi-levier entraîné (21) et donc, pendant le test , le poussoir (11) du relais peut faire tourner librement ledit demi-levier (20) jusqu'à la fermeture d'un contact (29) qui confirme que le système de protection est efficace, tandis que l'autre demi-levier (21) et le mécanisme d'accrochage sont immobiles.

3. Dispositif selon la revendication 1, caractérisé en ce que la liaison entre les dits deux demi-leviers (20,21) est réalisée au moyen d'une goupille ou d'un verrou introduit dans des trous appropriés ménagés sur les parois latérales desdits deux demi-leviers qui peuvent devenir indépendants l'un de l'autre seulement lorsqu'un agent extérieur, tel qu'un électro-aimant, retire ladite goupille ou ledit verrou d'au moins un desdits demi-leviers.

4. Dispositif selon la revendication 1, caractérisé en ce que lesdits deux demi-leviers (20,21) sont rendus solidaires l'un de l'autre par des moyens magnétiques.

5. Dispositif selon la revendication 1, caractérisé en ce que lesdits deux demi-leviers (20,21) sont solidaires l'un de l'autre pendant l'ordre de fonctionnement normal tandis que, pendant le test, ils deviennent indépendants l'un de l'autre au moyen de dispositifs hydrauliques ou pneumatiques appliqués auxdits demi-leviers et guidés extérieurement.

6. Dispositif selon la revendication 1, caractérisé en ce que l'interruption de la chaîne de coupure est obtenue par rotation, ou translation, ou les deux, du relais (10) au moyen d'un dispositif extérieur (52,53,54) d'une manière telle que ledit relais (10) atteint pendant le test une position différente dans laquelle le poussoir (11) du relais (10) actionne un levier (56) afin de fermer le contact (58) de confirmation de l'efficacité de la protection.

7. Dispositif selon la revendication 2, caractérisé en ce qu'il comprend un bouton (60) à presser manuellement extérieurement, qui supporte, en plus des contacts électriques nécessaires à l'injection d'un courant de défaut simulé provoquant l'intervention de l'appareil sous contrôle, une came (77) permettant de déplacer un axe (14) qui déplace à son tour un demi-levier (20) libre de tourner sur ledit axe (14) et qui perd, après ce déplacement, sa liaison à un deuxième demi-levier (21).

8. Dispositif selon la revendication 7, caractérisé en ce que la came (77), qui provoque le déplacement de l'axe (14) sur lequel les deux demi-leviers (20, 21) tournent, est bloquée dans sa position par rapport au bouton (60) par un levier (71), articulé sur la partie fixe de l'appareil, qui glisse sur un côté de ladite came (77) de façon à la maintenir à sa position même lorsque le bouton pressé (60) se déplace, ledit levier (71) ayant deux positions stables dont l'une est la position mentionnée ci-dessus et dont l'autre est tournée d'un certain angle par rapport à la première position et éloigne le levier de ladite came (77) et ne maintient donc plus celle-ci, de sorte que le bouton (60) peut exécuter toute autre fonction sauf celle à laquelle la came (77) est

affectée.

9. Dispositif selon la revendication 7, caractérisé en ce qu'il est pourvu de moyens simples pour actionner ensuite deux circuits électriques, dont l'un est le circuit d'une lampe de signalisation (89) et dont l'autre permet de simuler un courant de défaut, lesdits circuits étant synchronisés avec les actions mécaniques déjà décrites.

10. Dispositif selon les revendications précédentes 7,8,9,caractérisé en ce que le bouton (60) est remplacé par un autre actionneur quelconque (par exemple un levier ou un bouton rotatif) et, de toute façon, exécuté et actionné.

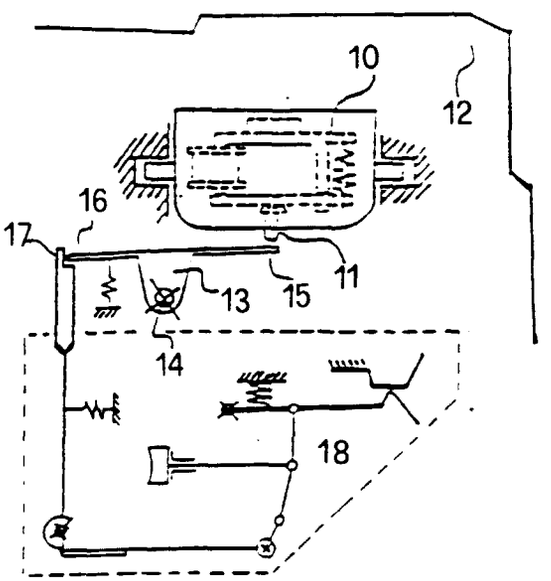

FIG. 1

FIG. 2

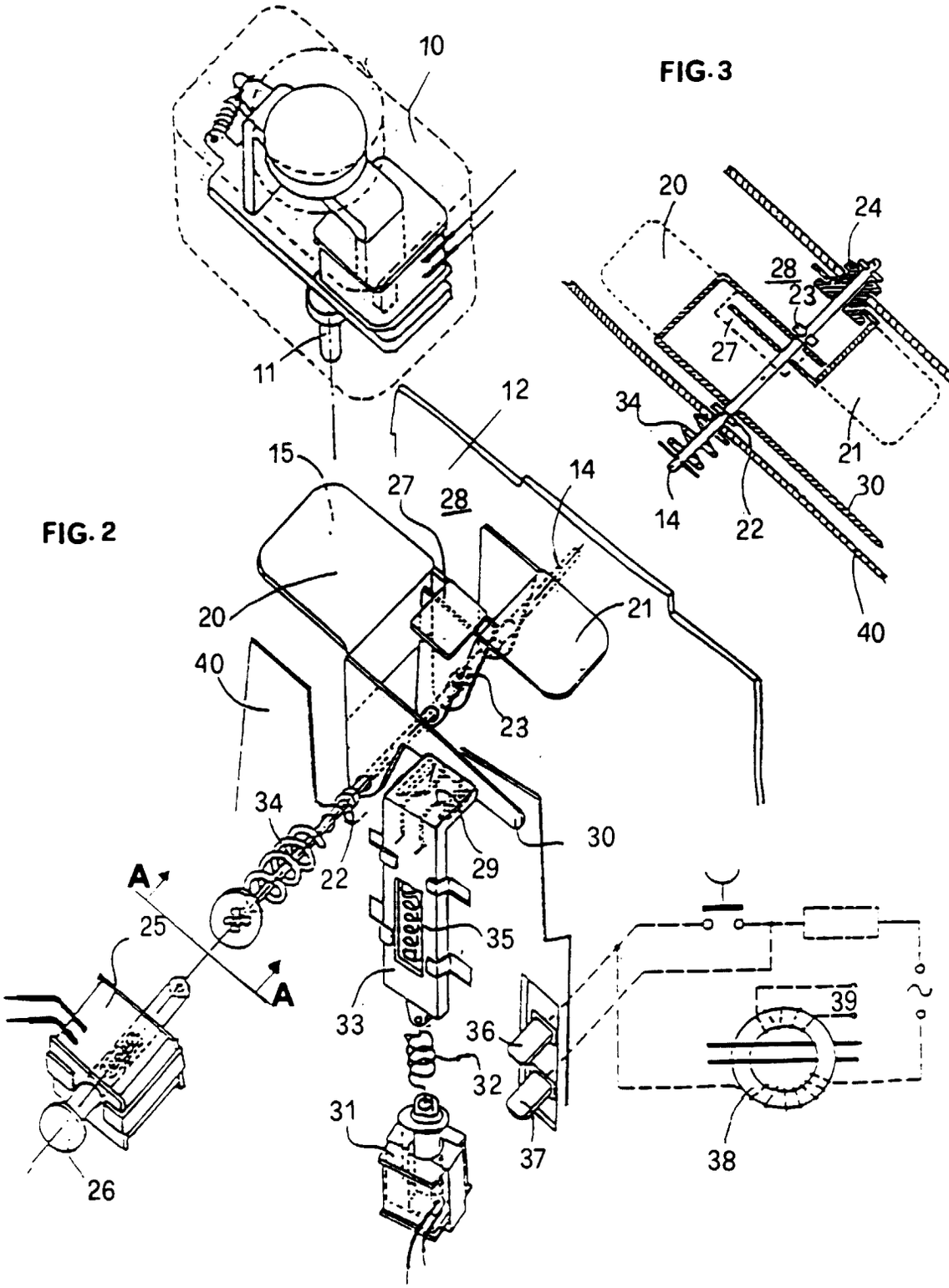
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FIG. 3

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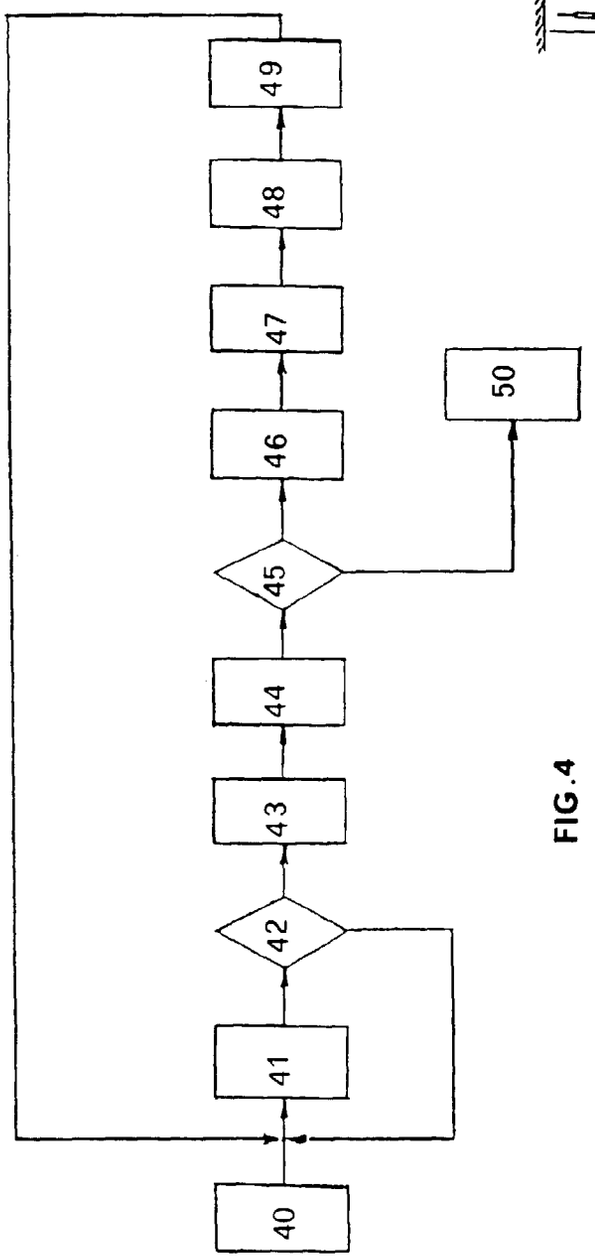

FIG.4

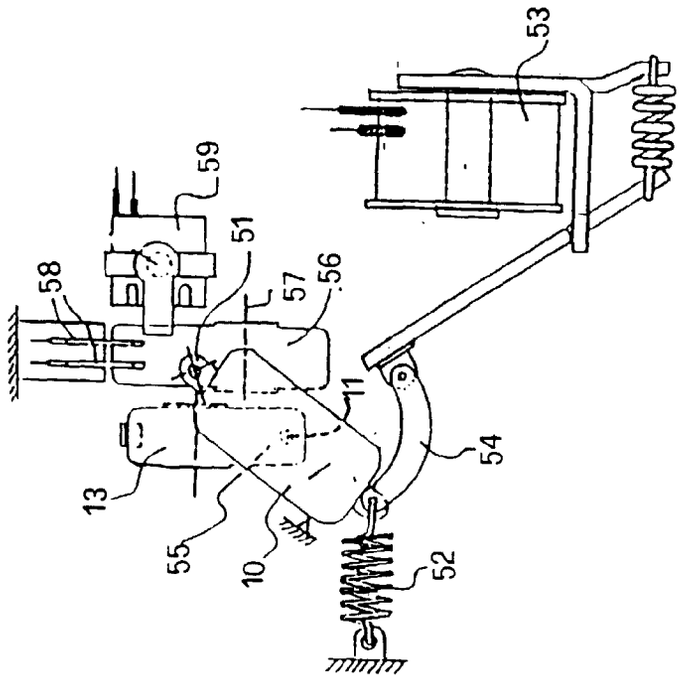

FIG.5

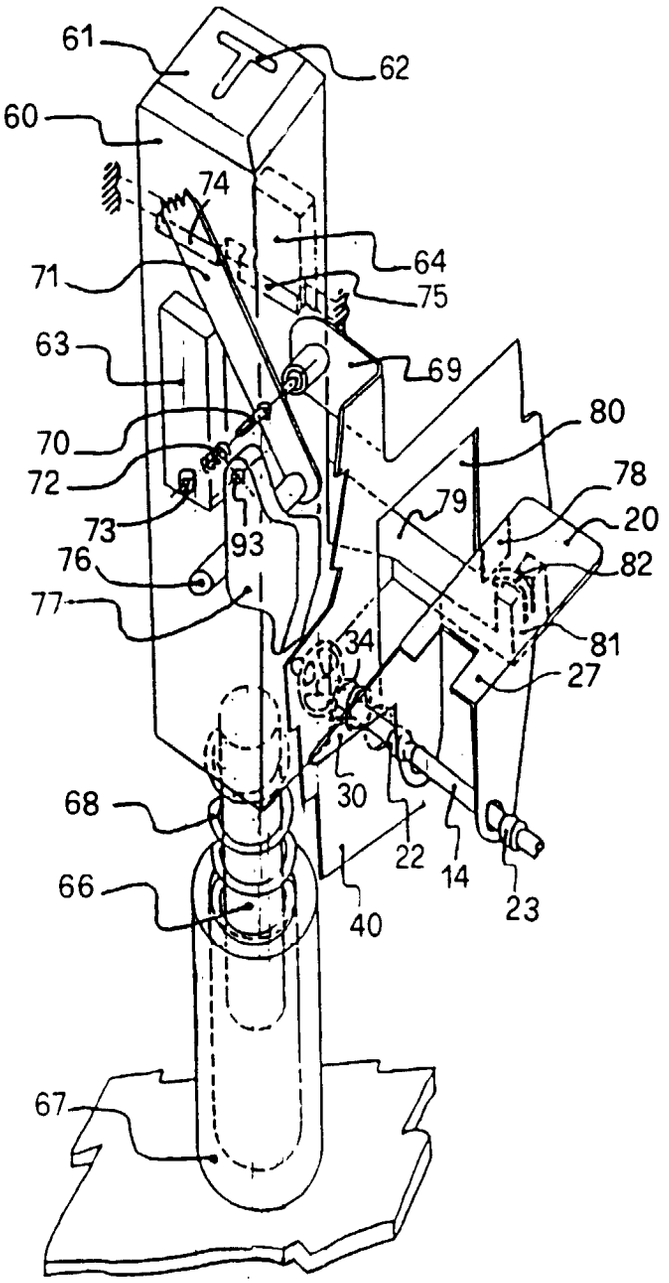
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FIG. 6

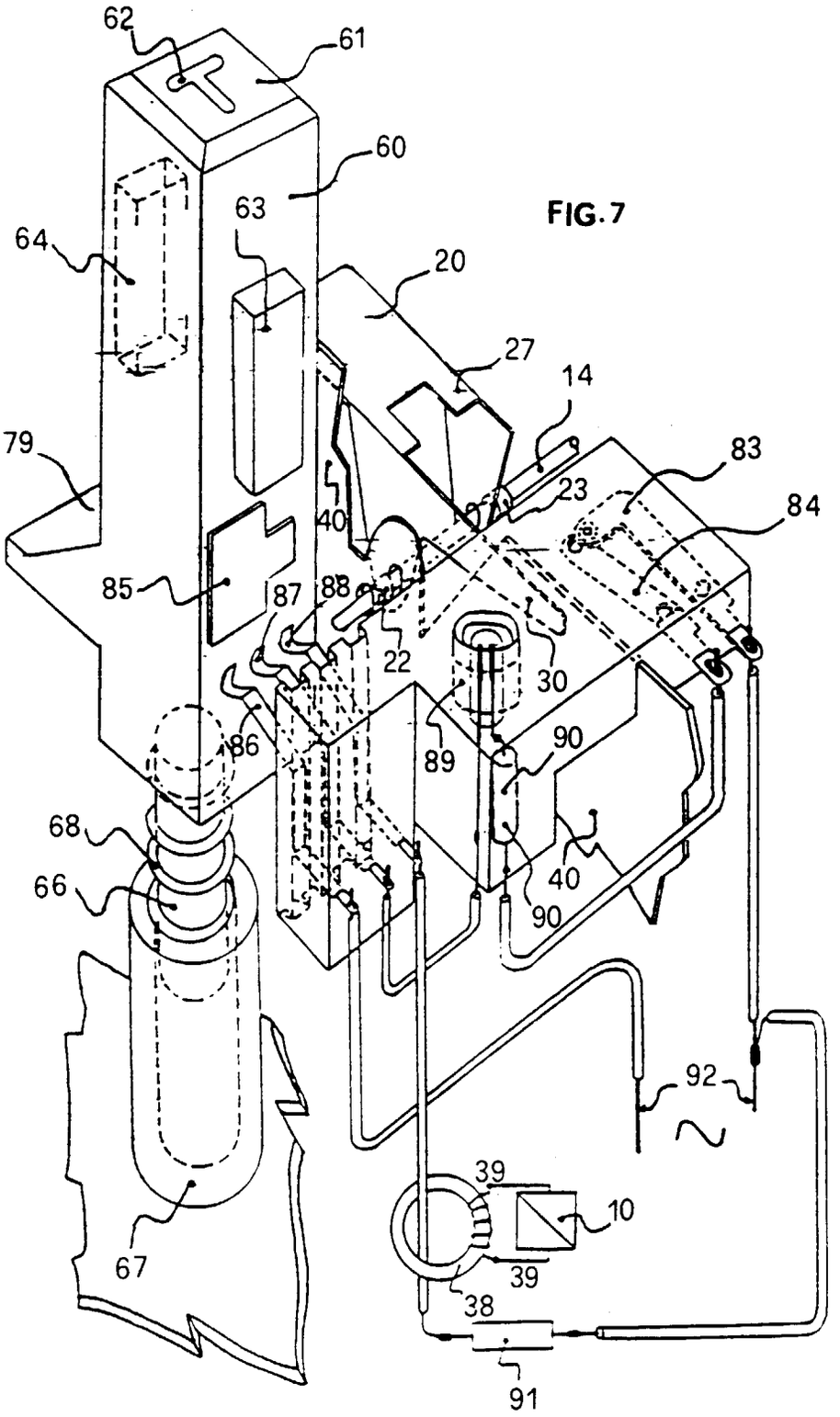
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FIG. 7