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(71) Applicant: **Gewiss S.P.A.**
24069 Cenate Sotto (IT)

(72) Inventor: **Bosatelli, Domenico**
24069 Cenate Sotto (Bergamo) (IT)

(74) Representative:
Forattini, Amelia et al
c/o Internazionale Brevetti
Ingg. ZINI, MARANESI & C. S.r.l.
Piazza Castello 1
20121 Milano (IT)

(54) Modular auxiliary electrical device particularly for electrical circuit breakers and the like

(57) A modular auxiliary electrical device, particularly for electrical circuit breakers and the like, comprising a box-like body adapted to be associated with an electrical device, such as a circuit breaker, and an electrical connection means for connection to conducting components. The electrical connection means is actuated by a kinematic means in response to an intervention of the electrical device. The device also comprises a quick coupling system including snap-acting elastic pins which can be inserted in corresponding seats formed in an adjacent device to be associated.

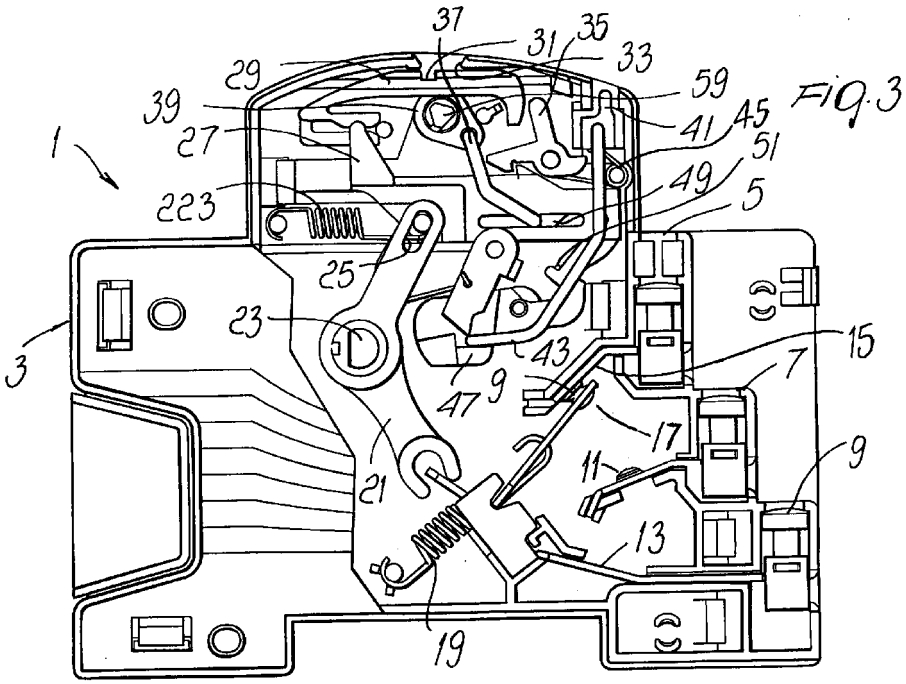

FIG.3

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Description

[0001] The present invention relates to a modular auxiliary electrical device, particularly for electrical circuit breakers and the like.

[0002] Auxiliary devices can be associated with an electrical device, such as a magnetothermal and residual-current circuit breaker, in order to electrically and visually indicate the position of the contacts, when used as an auxiliary contact, or to indicate that the circuit breaker has intervened due to an overload or short-circuit, when used as a tripped-relay contact.

[0003] It is known that magnetothermal electric circuit breakers use kinematic systems which allow to open and close the moving contact both by operating an external lever which can be accessed by the user and by way of the automatic intervention of the internally provided protection devices.

[0004] The two constant problems in the design of these circuit breakers and of the auxiliary devices are the complexity of the mechanisms and their dimensions.

[0005] The need is constantly felt to simplify the kinematic systems from the constructive point of view in order to make production cost-effective, and in this regard it is also very important to achieve an assembly process which is simple and can be automated.

[0006] Another fundamental problem is to improve the performance of the devices while maintaining compact dimensions which in any case comply with the standards.

[0007] The aim of the present invention is to provide a modular auxiliary electrical device with improved constructive and operating characteristics with respect to the devices of the prior art.

[0008] An object of the invention is to provide a modular auxiliary electrical device which can be manufactured more cheaply than conventional ones and at the same time has an improved performance.

[0009] Another object of the present invention is to provide a modular auxiliary electrical device which is more reliable in use.

[0010] Another object of the present invention is to provide a modular auxiliary electrical device which can be installed easily and rapidly and in particular without the aid of external locking devices such as hooks, U-bolts or the like.

[0011] This aim, these objects and others which will become better apparent hereinafter are achieved by a modular auxiliary electrical device, particularly for electrical circuit breakers and the like, which comprises a box-like body which is adapted to be associated with an electrical device, such as a circuit breaker, and comprises an electrical connection means for connection to conducting components, the electrical connection means being actuated by a kinematic means in response to an intervention of the electrical device; characterized in that it comprises a snap-acting means for quick engagement with the electrical device.

[0012] Further characteristics and advantages of the present invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic perspective view of two coupled auxiliary devices according to the present invention;
Figure 2 is a schematic perspective view of an auxiliary device associated with a circuit breaker according to the present invention;
Figure 3 is a sectional lateral elevation view, taken along a longitudinal plane, of the device according to the present invention;
Figure 4 is a sectional lateral elevation view, taken from the opposite side with respect to Figure 3 and along a longitudinal plane, of the device according to the present invention;
Figure 5 is a partial lateral elevation view of the kinematic system for the actuation of the device when acting as an auxiliary contact, shown in the position in which the normally-open contact is closed and the normally-closed contact is open;
Figure 6 is a schematic top view of the kinematic system for the actuation of the device, shown in the same position as in Figure 5;
Figure 7 is a partial lateral elevation view of the kinematic system for the actuation of the device in the activated circuit breaker or open-lever position, in which the normally-open contact is open and the normally-closed contact is closed;
Figure 8 is a schematic top view of the kinematic system for the actuation of the device, shown in the same position as in Figure 7;
Figure 9 is a partial lateral elevation view of the kinematic system for the actuation of the device in the relay trip function, shown in the intervention condition during the rotation of the intermediate engagement member;
Figure 10 is a schematic top view of the kinematic system for the actuation of the device, shown in the same position as in Figure 9;
Figure 11 is a partial lateral elevation view of the kinematic system for the actuation of the device in the tripped position;
Figure 12 is a schematic top view of the kinematic system for the actuation of the device, shown in the same position as in Figure 11;
Figure 13 is a partial lateral elevation view of the kinematic system for the actuation of the device in the armed position;
Figure 14 is a schematic top view of the kinematic system for the actuation of the device, shown in the same position as in Figure 13;
Figure 15 is a partial lateral elevation view of the kinematic system for the actuation of the device, in

the tripped relay position;

Figure 16 is a schematic top view of the kinematic system for the actuation of the device, shown in the same position as in Figure 15;

Figure 17 is a partially sectional schematic front view of two devices according to the invention during approach for mutual coupling, according to the present invention;

Figure 18 is a view, similar to Figure 17, of the two devices during coupling, according to the present invention;

Figure 19 is a view, similar to Figure 18, of the two devices in the coupled configuration, according to the present invention.

[0013] With reference to the above figures, the modular auxiliary electrical device according to the invention, generally designated by the reference numeral 1, comprises a box-like body 3 which comprises an electrical contact means, constituted by contact terminals, respectively 5, 7 and 9, which in turn are respectively electrically connected to respective upper, lower and central contacts 15, 11 and 13. A moving contact 17 is movable between at least two positions, between the fixed upper contact 15 and, alternately, between the lower fixed contact 11, in order to connect them alternately to the central fixed contact 13.

[0014] The moving contact 17 oscillates thanks to the action of, and in contrast with, a moving contact spring 19 and an actuation lever 21 which is provided with a pivot 23 in its fulcrum. The actuation lever 21 is connected to an actuation lever return spring 223 and has an arm which is connected, by means of a slot 25, to a slider 27 which is adapted to act on an indicator 29 which also acts as a function selector for the device.

[0015] The indicator/selector 29 is provided with a slot 31 which can be accessed, through the opening 33 of the box-like body 3, for example by means of a screwdriver, in order to move the position of the indicator/selector so as to select the function of the device between the auxiliary contact mode, shown in Figures 5 and 6, and the tripped relay contact mode, shown in Figures 7-16.

[0016] Selection occurs by sliding the indicator/selector 29, which acts on the function hook 35, which is in turn adapted to engage or not engage the slider 27. The slider 27 is kinematically associated with a lever crossbar 37, which is in turn associated with the lever 39 (shown only schematically in its pivoting portion).

[0017] An externally accessible test button 41 is connected to a test button crossbar 43 which in turn acts on a tripped-mode linkage 47. The test button 41 can be actuated in contrast with a button spring 45, which is adapted to also act on the hook 35, pushing it into the position for engaging the slider 27.

[0018] The tripped-mode linkage 47 is kinematically connected to an intermediate engagement member 49 which in turn engages the slider 27 and is controlled by a spring 51 of the intermediate engagement member. The tripped-mode linkage 47 has, on the side that faces the circuit breaker 55 with which the auxiliary device is associable, a pivot 53 for actuation and connection to an adjacent electrical device. The actuation lever 37 also has, on the same side, a lever pivot 57 which is adapted to engage a corresponding seat in the lever of the circuit breaker or other associated device. On the opposite side with respect to the preceding one, the lever 39 comprises a lever seat 59 which is adapted to receive a lever pivot of an adjacent device.

[0019] The device 1 according to the invention comprises a system for quick engagement with the adjacent devices. The engagement system is provided with a plurality of elastic pivots 61, four in the illustrated case, which are adapted to be inserted with a snap action in corresponding seats 63 formed on the adjacent side of the device to be associated.

[0020] The device 1 comprises, on the opposite side, seats 63 for receiving a second auxiliary device 101, as shown in Figures 17-19.

[0021] As mentioned, the modular auxiliary electrical device 1 according to the invention can be associated with a magnetothermal and residual-current circuit breaker in order to electrically and visually indicate the position of the contacts, when acting as an auxiliary contact, or to indicate that the circuit breaker has intervened due to overload or short-circuit, when acting as a tripped-relay contact.

[0022] The two normally-open and normally-closed contacts are connected to the respective terminals, capable of clamping cables of various sizes, in a per se known manner.

[0023] The contacts, actuated by the actuation lever 21, assume the open or closed position depending on the position of the contacts or on the intervention of the associated circuit breaker.

[0024] The indicator/selector 29 and the test button 41 are visible at the front (in an upward region in the figures). The indicator/selector allows to select the type of function of the device, i.e., auxiliary contact or tripped-relay contact; at the same time, the indicator/selector 29 visually indicates, when acting as a tripped-relay contact, that the associated circuit breaker has intervened. The test button allows to check that the configurable auxiliary contact has been installed correctly and correctly operates over time.

[0025] The pivot 57 of the operating lever, the pivot 53 of the tripped-mode linkage and the quick engagement system constituted by the pins 61 are arranged laterally (on the side meant to face the circuit breaker).

[0026] The seat 59 for the pivot 57 of the operating lever is visible on the other side, which can be arranged laterally adjacent to another auxiliary device (configurable auxiliary contact, release coils).

[0027] The mechanical coupling of the device to a circuit breaker, or to a similar device, occurs as men-

tioned thanks to an engagement system which comprises the four elastic pins 61, which rigidly couple it to the latter. The particular geometry of the pins 61 allows easy mutual centering of the devices and straightforward assembly. Moreover, the device according to the present invention does not require the use of external additional fixing components and provides the coupling and engagement system directly as part of the plastic shells.

[0028] When the circuit breaker or the auxiliary device with which it is associated are in the same position as the lever, it is necessary to place the devices side by side and push them toward each other, until one hears the clicking sound that confirms that engagement has occurred, as shown schematically in Figures 17, 18 and 19. At this point it is possible to check correct assembly by means of the test button 41. Motion is transmitted from the circuit breaker to the device by means of the pivot of the test lever.

[0029] If the contact is active as an auxiliary contact and one operates the circuit breaker from the "0" position (shown in Figures 7 and 8) to the "1" position (shown in Figures 13 and 14), the operating lever 39 of the device moves the slider 27 and the actuation lever 21 of the moving contact into the so-called "1" position. In this position, the contacts switch as shown in Figures 5 and 6; the normally-open contact closes and the normally-closed contact opens. The opening movement of the lever of the circuit breaker (from 1 to 0) or the possible intervention of the circuit breaker restores the preceding situation, i.e., the closure of the normally-closed contact and the opening of the normally-open contact (the moving contact has assumed the 0 position), as shown in Figures 7 and 8.

[0030] In the tripped-relay contact function, once the accessory has been armed to the "1" position (as described above), at each subsequent operation for closing or opening the lever of the circuit breaker the contacts and the kinematic system of the device remain in the "1" position, shown in Figures 13 and 14. When the automatic device intervenes, the tripped-mode linkage 47 is struck from above, causing the rotation of the intermediate engagement member 49, as shown in Figures 9 and 10; this in turn releases the slider 27 of the engagement member and the intermediate engagement member from the lever crossbar 37. The device then assumes the "0" position and an orange marker appears in the selection and indication opening (Figures 11 and 12).

[0031] The device according to the present invention differs from similar devices of the prior art in the following particularities.

[0032] The quick engagement system.

[0033] The independent release force: a plurality of devices can in fact be coupled with the above-described system without applying all the release forces of the kinematic chain to the kinematic system of the automatic circuit breaker. This is achieved thanks to a transmission linkage 65 which, being rigidly coupled to the slider 27, strikes the pivot of the tripped-mode linkage 47 (Figures 11 and 12) of the optional laterally adjacent accessory.

[0034] The selection/indication system is integrated, and for example by means of a screwdriver it is possible to switch the indicator/selector 29 in the indicator opening from the auxiliary-contact function to the tripped relay-contact function by acting in the slot 31. The downward movement of the selector (from left to right with reference to Figure 3) in the auxiliary-contact function fixes the indicator/selector 29 to the base, moves the hook 35 away from the slider 27 and links the movement of the latter exclusively to the crosspiece of the operating lever. The upward movement of the selector (from left to right relative to Figures 9-16) in the tripped relay-contact function fixes the indicator/selector 29 to the slider 27 and releases the hook linkage which, pushed by the spring (hook/test button spring), locks the slider. The slider can be disengaged from the hook lever only by the movement that the intermediate engagement member receives from the tripped-mode linkage. During the intervention of the automatic circuit breaker, the tripped-mode linkage is turned and the indicator/selector, rigidly coupled to the slider, is moved into the tripped relay-contact position.

[0035] In practice it has been observed that the invention achieves the intended aim and objects.

[0036] The modular auxiliary electrical device according to the invention is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims. All the details may be replaced with technically equivalent elements.

[0037] The materials used, as well as the dimensions, may of course be any according to requirements and to the state of the art.

Claims

1. A modular auxiliary electrical device, particularly for electrical circuit breakers and the like, comprising a box-like body which is adapted to be associated with an electrical device, such as a circuit breaker, and comprises an electrical connection means for connection to conducting components, said electrical connection means being actuated by a kinematic means in response to an intervention of said electrical device; characterized in that it comprises a snap-acting means for quick engagement with said electrical device.

2. The device according to claim 1, characterized in that said quick-engagement snap-acting means comprises a plurality of elastic pins which are adapted to be inserted by snap action in corresponding seats formed in a device to be associated and on said auxiliary device in order to receive an additional auxiliary device.

3. The device according to claim 1 or 2, characterized in that it comprises a function switching member and a visual indication member, integrated into a single part.

4. The device according to one or more of the preceding claims, characterized in that said switching and indication member is externally visible through an opening formed in said box-like body and comprises a slot which can be accessed through said opening in order to switch the position of said switching and indication member.

5. The device according to one or more of the preceding claims, characterized in that said kinematic means comprises a return lever which is adapted to make the release force independent, so that a plurality of devices can be coupled without applying all the release forces of the kinematic chain to the kinematic system of the automatic circuit breaker or other main electrical device.

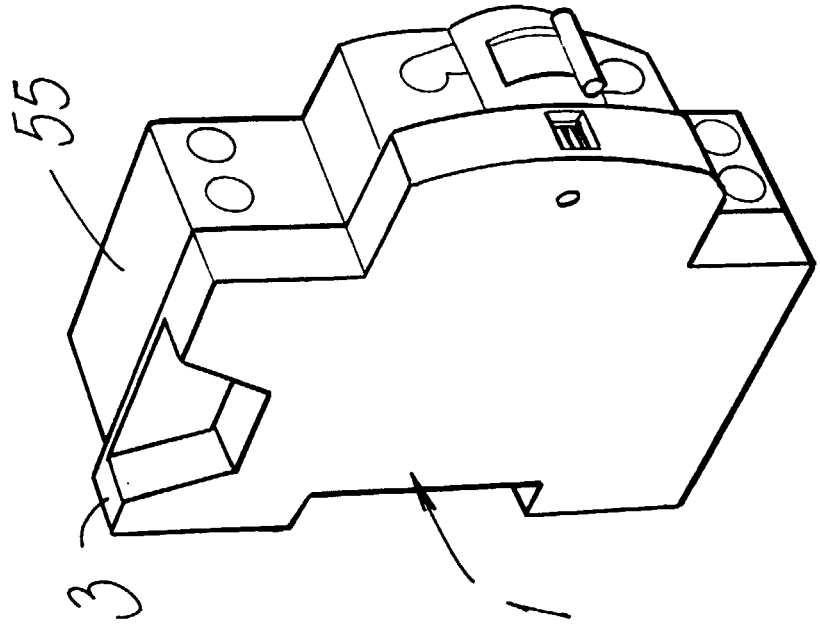


Fig. 2

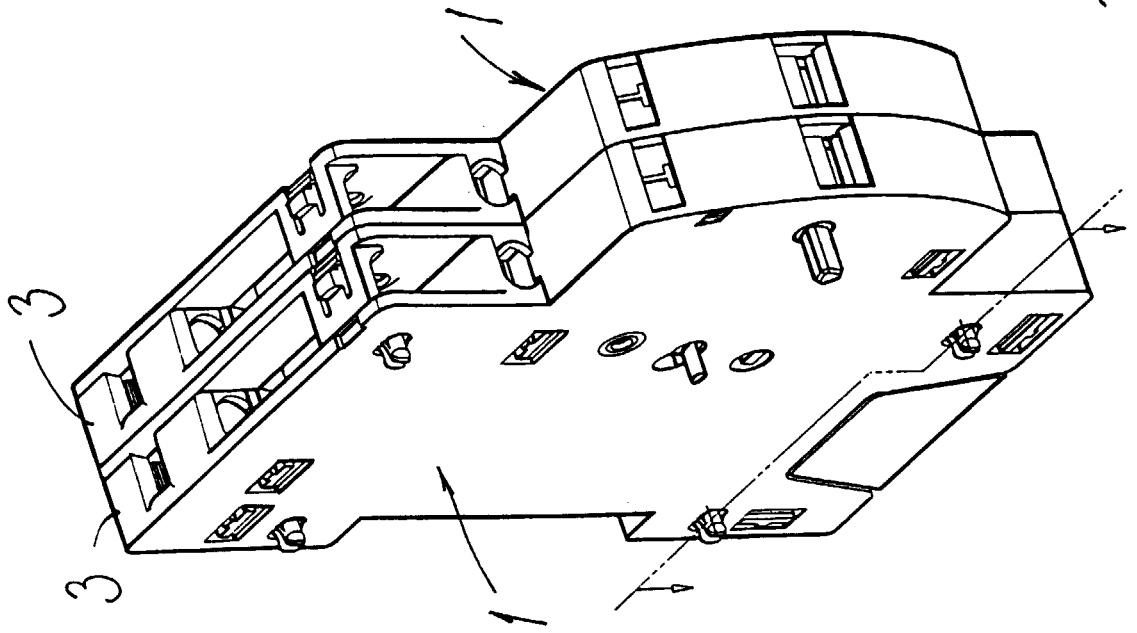
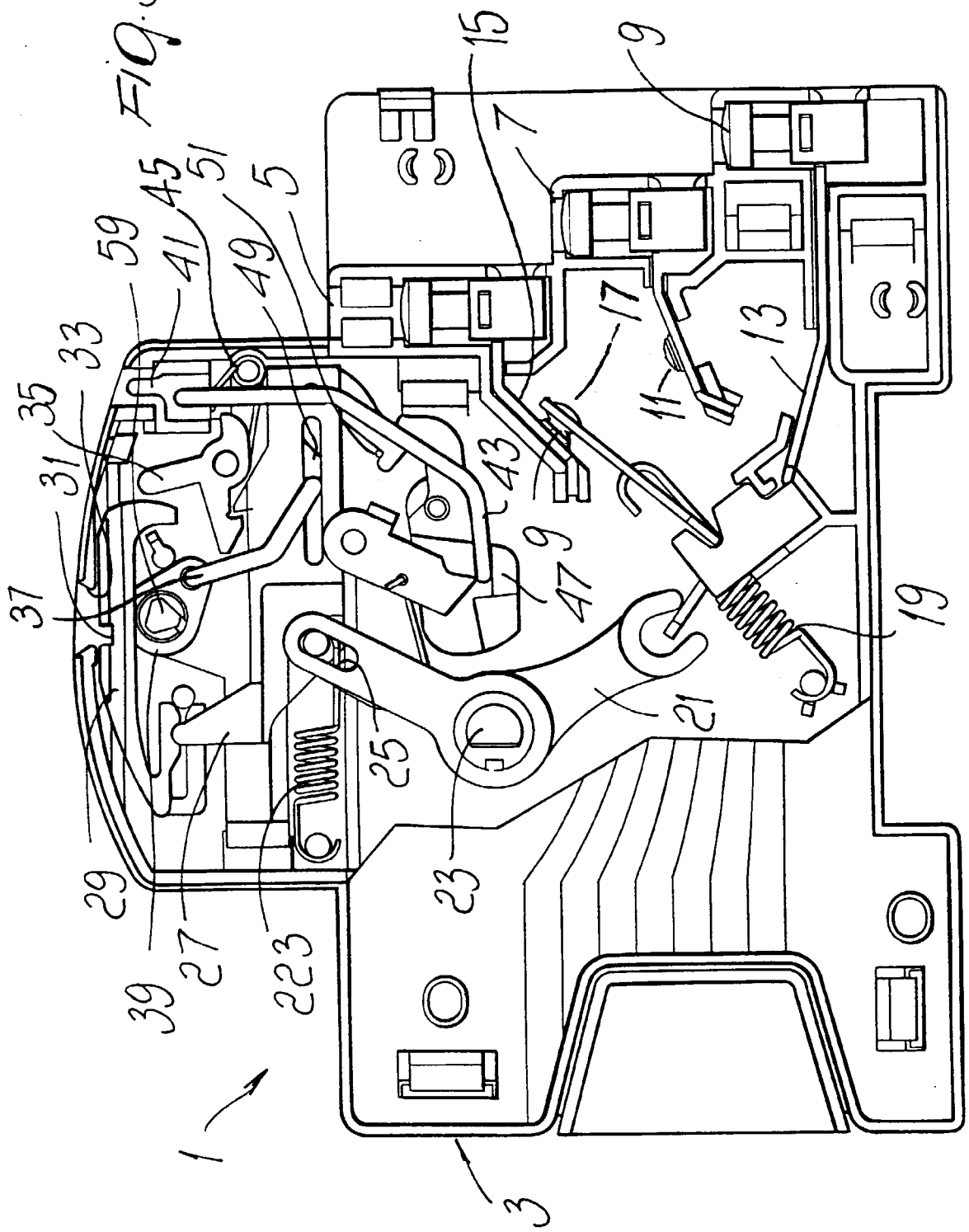


Fig. 1

FIG.3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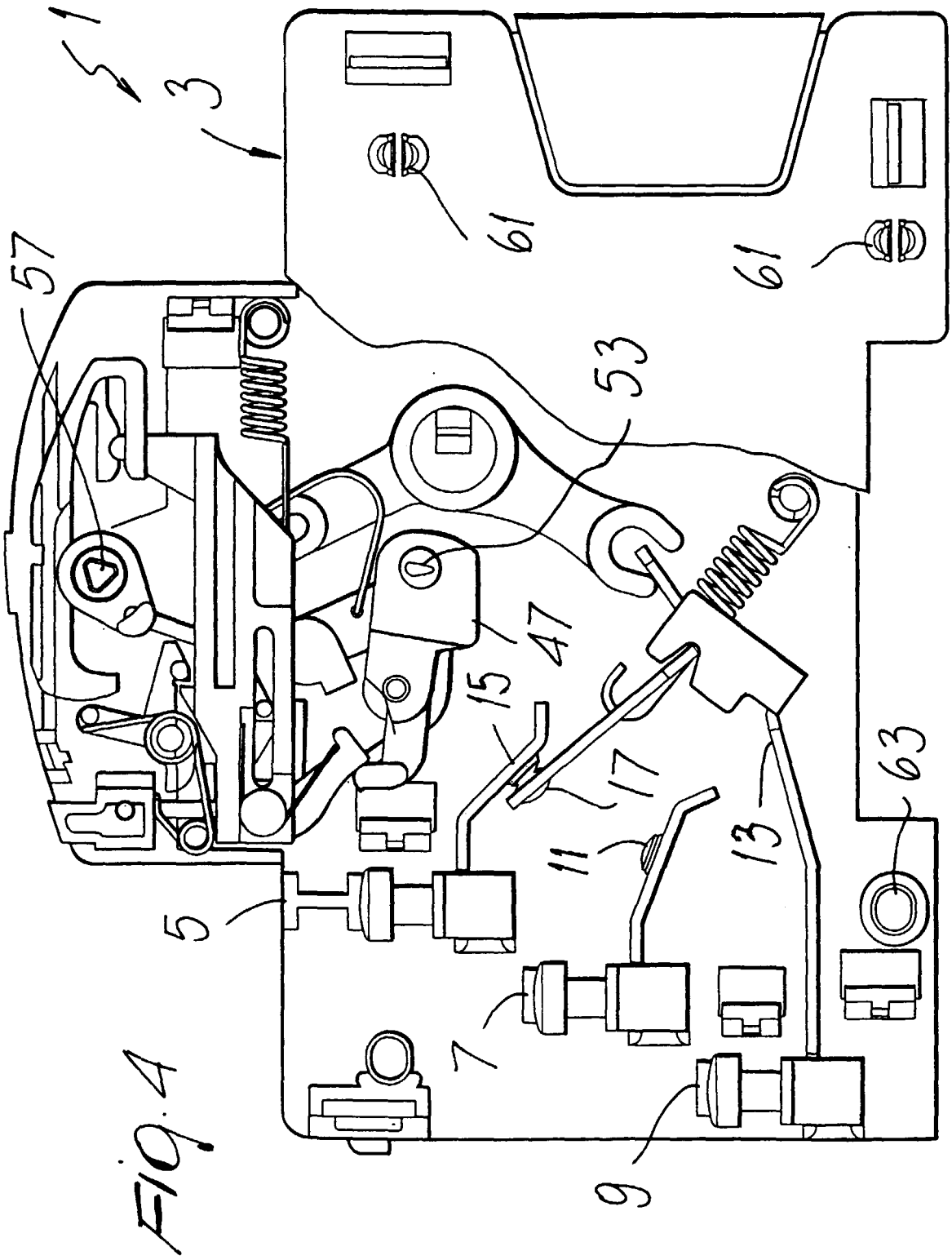

Fig. 4

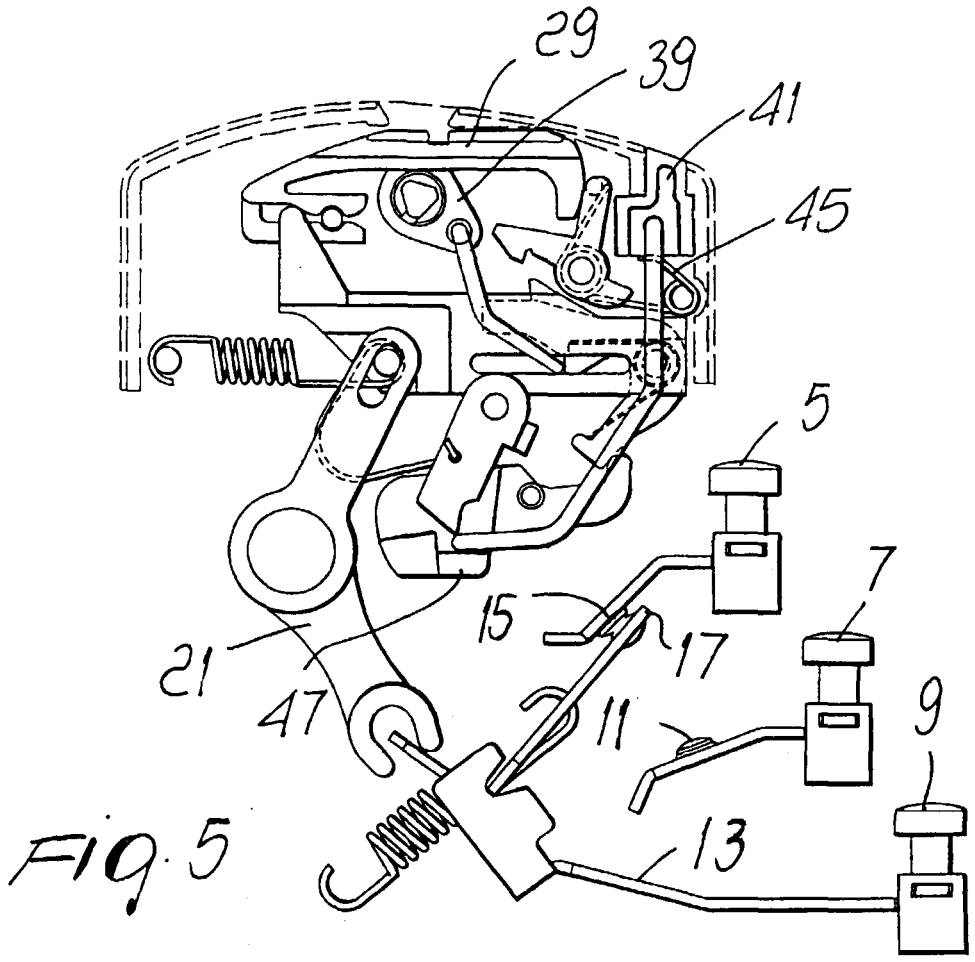

FIG. 5

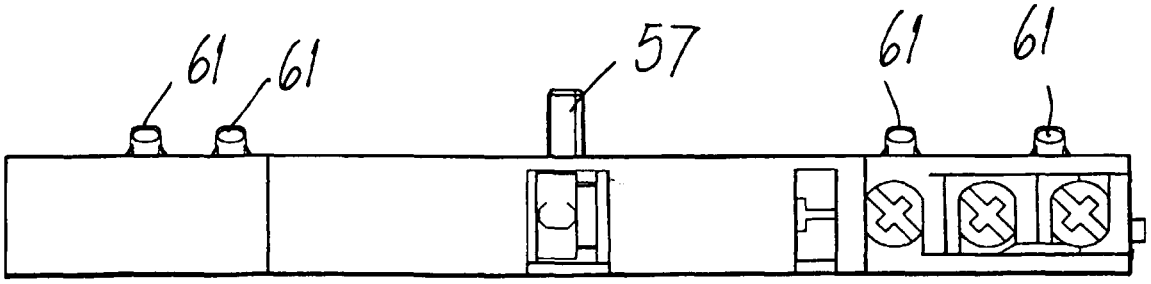

FIG. 6

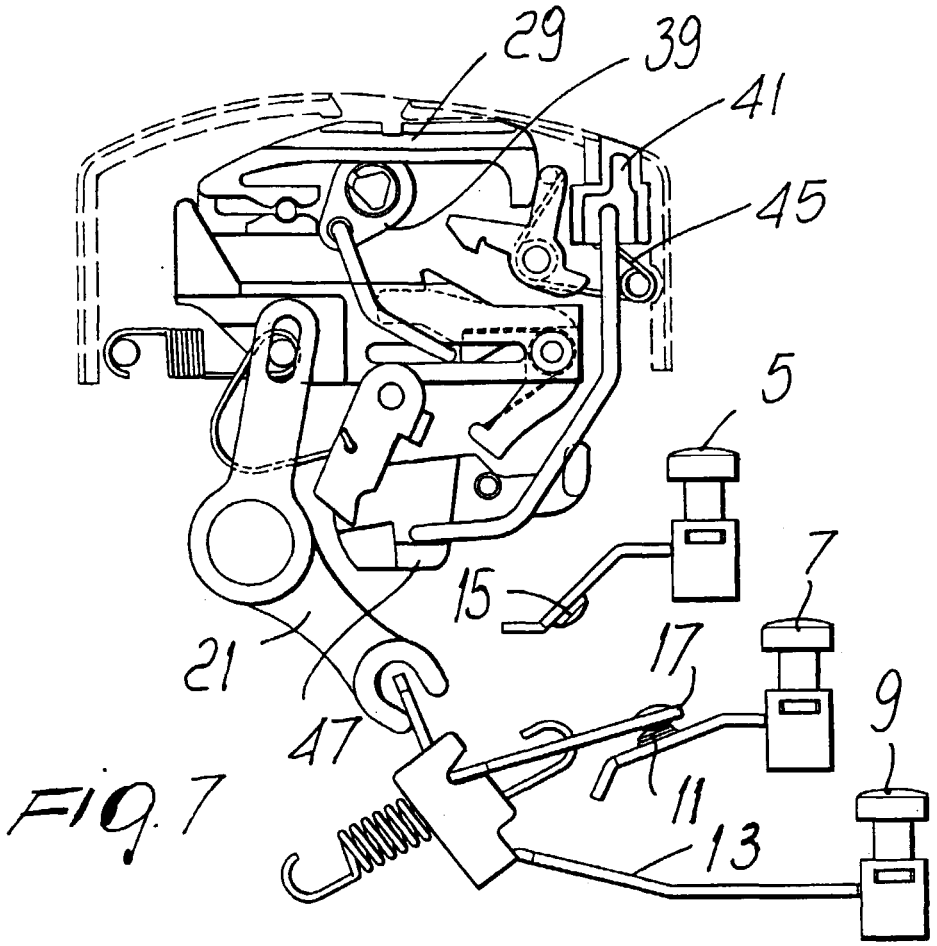

FIG. 7

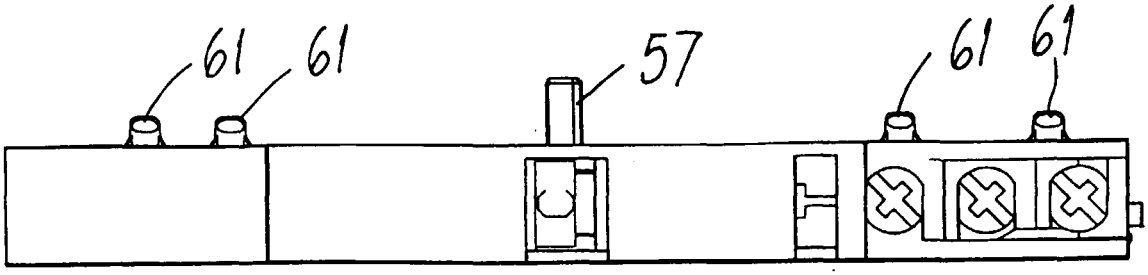

FIG. 8

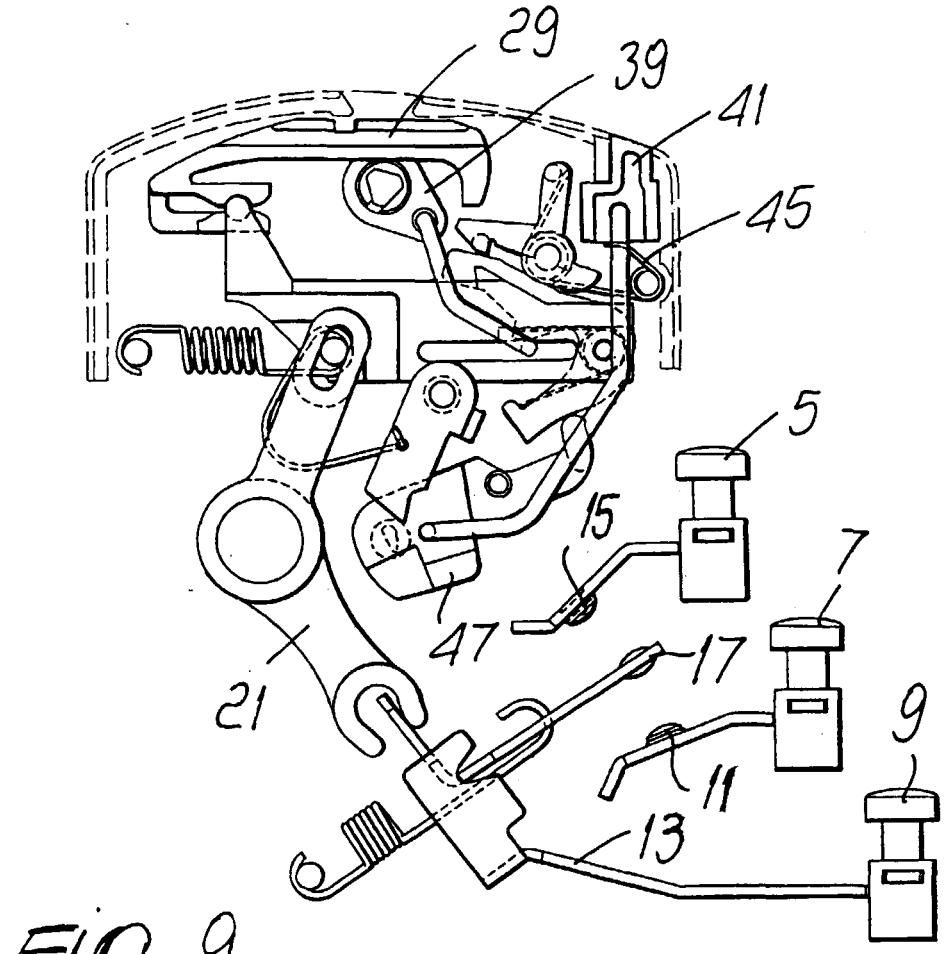

FIG. 9

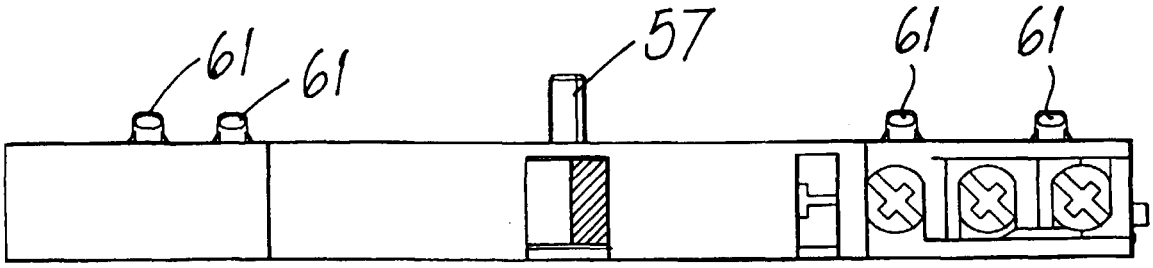

FIG. 10

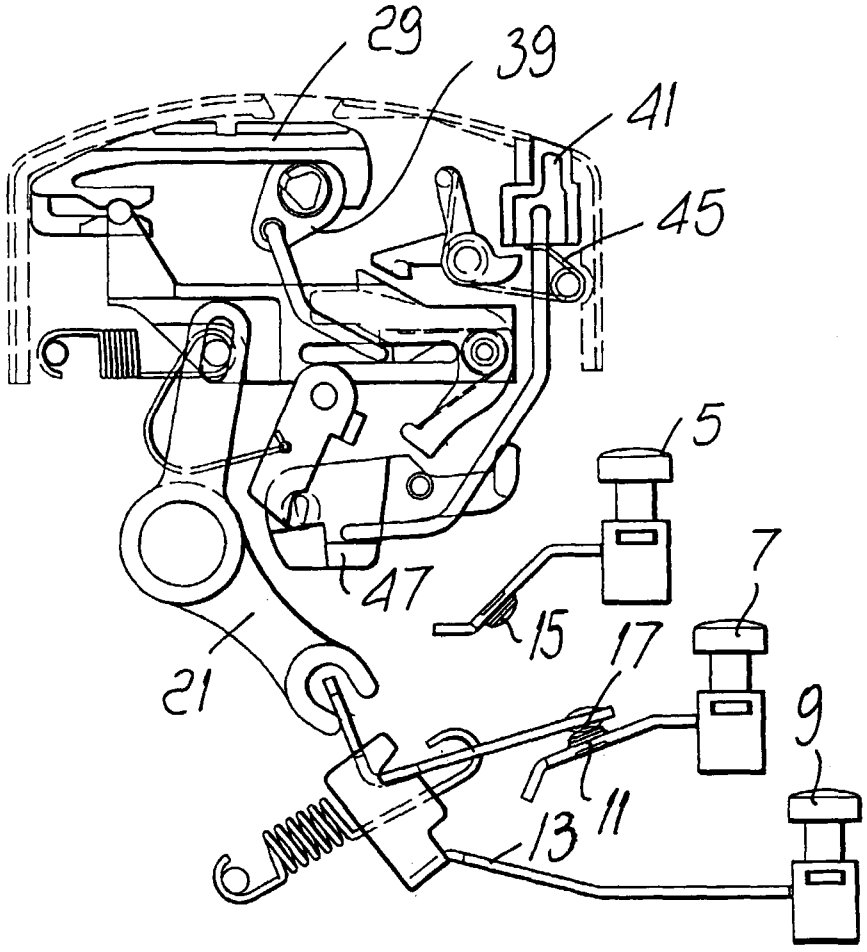

FIG. 11

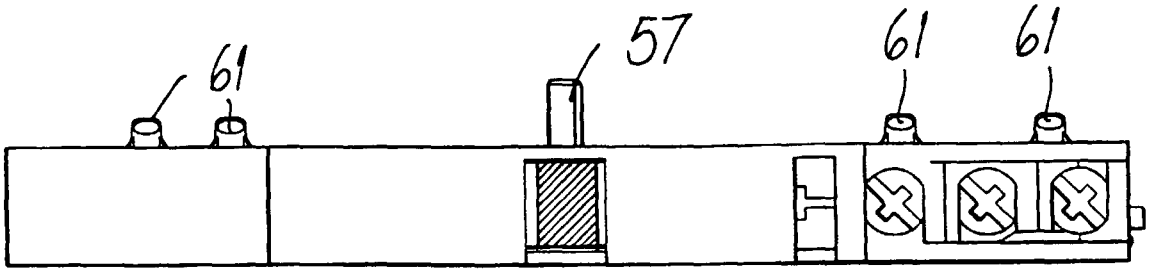

FIG. 12

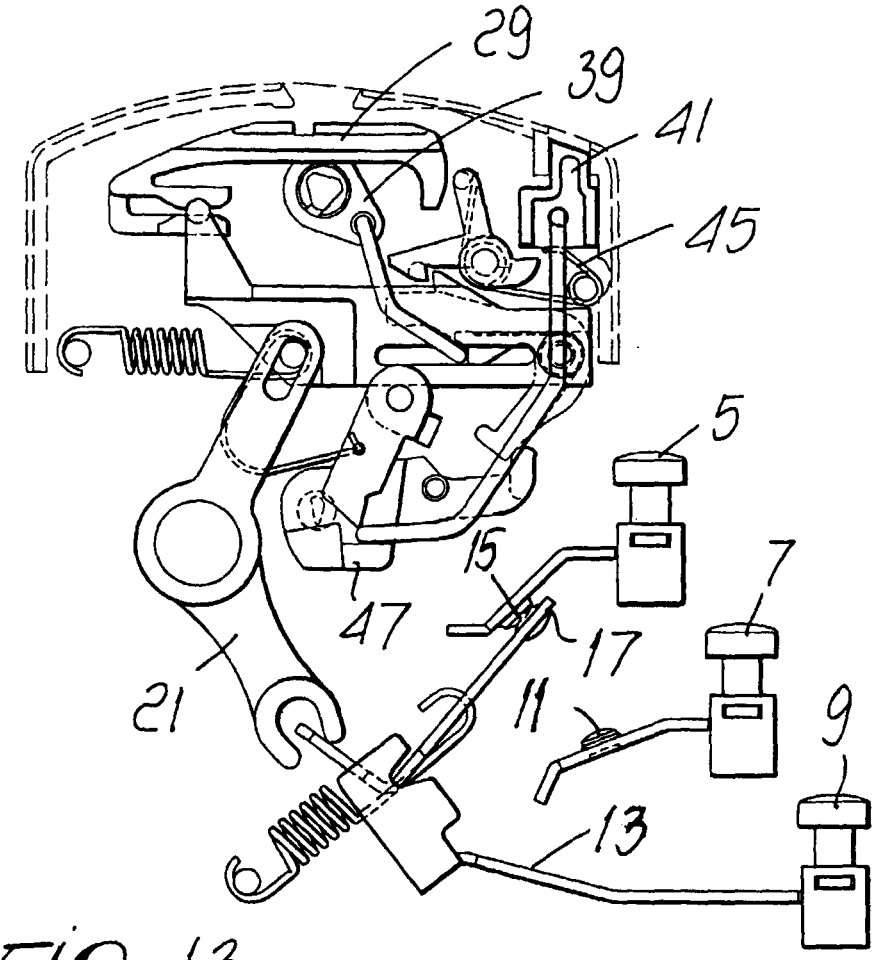

FIG. 13

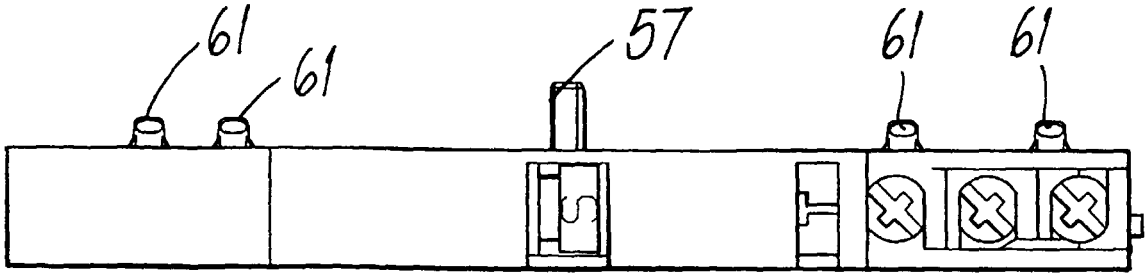

FIG. 14

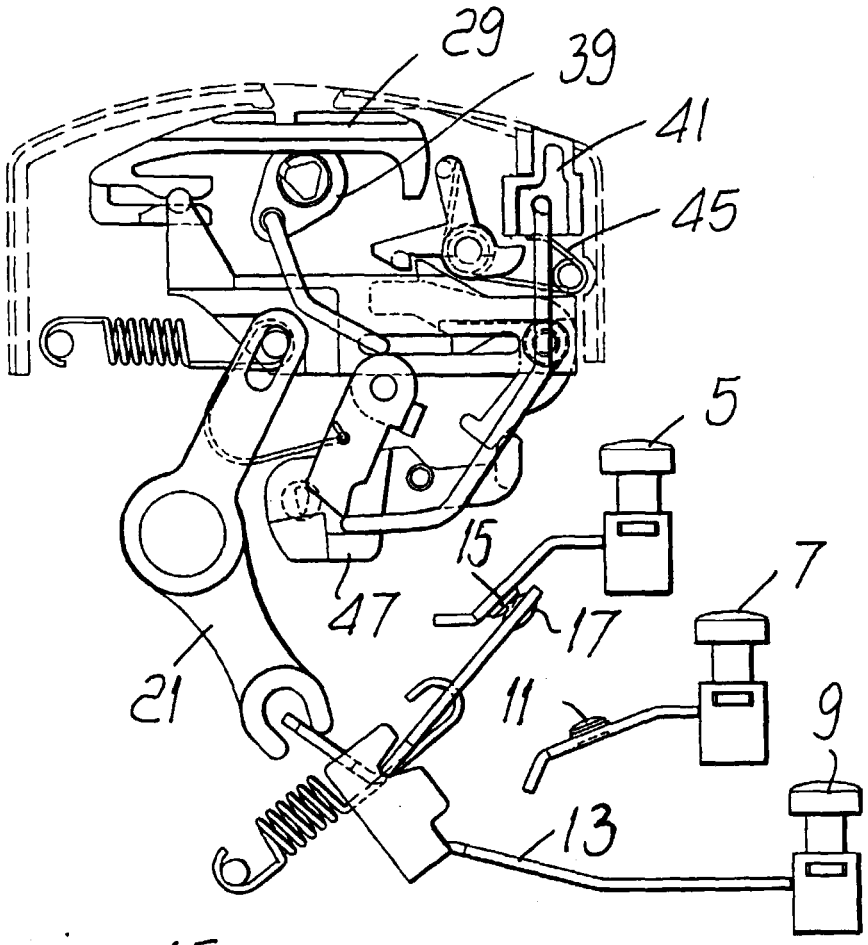

FIG. 15

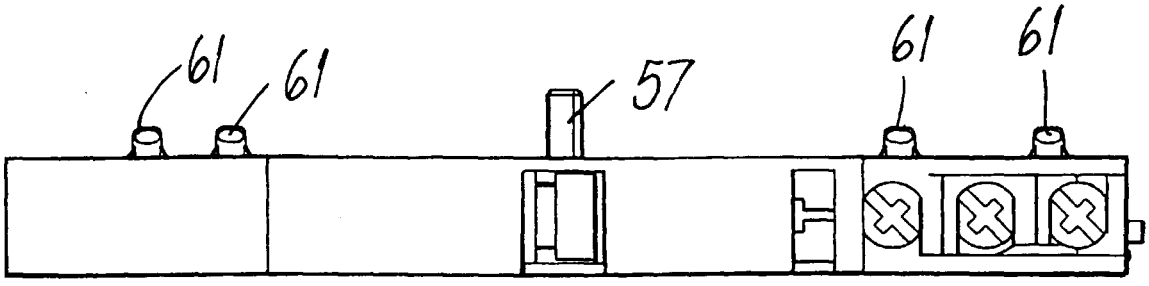

FIG. 16

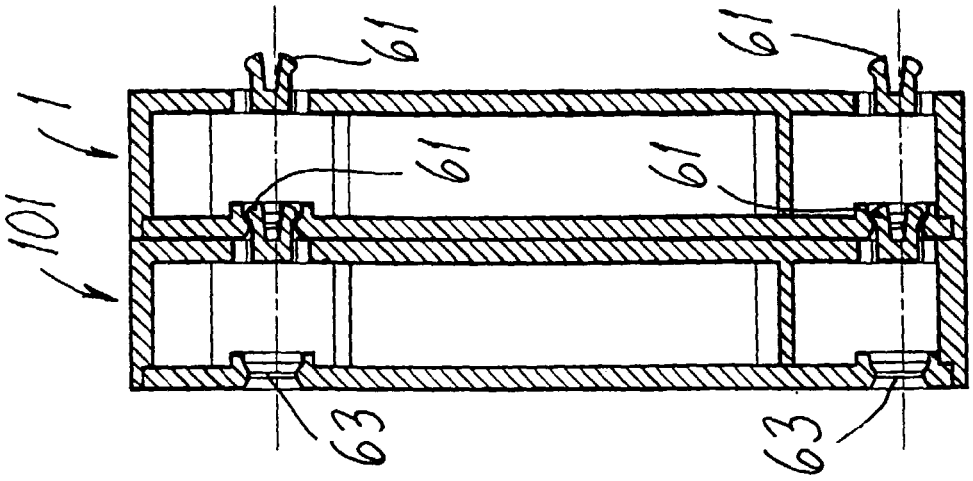

FIG. 19

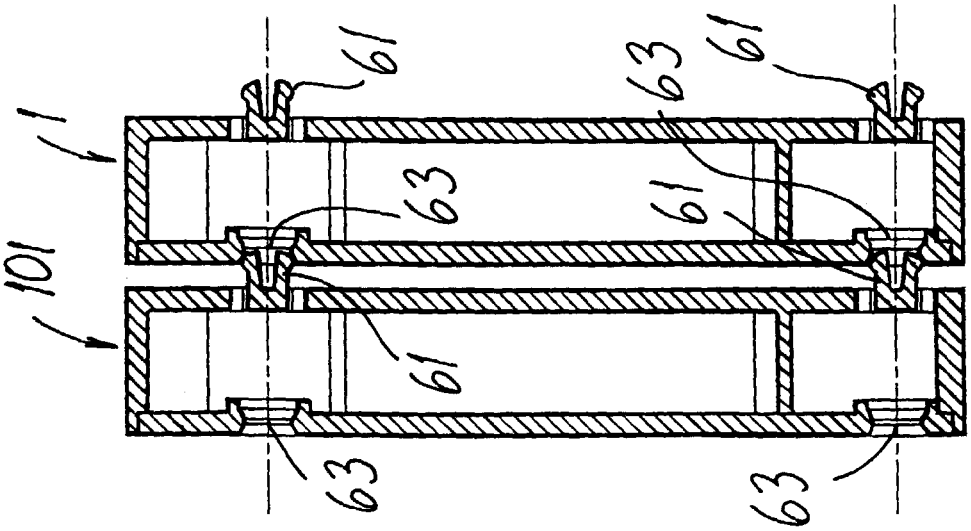

FIG. 18

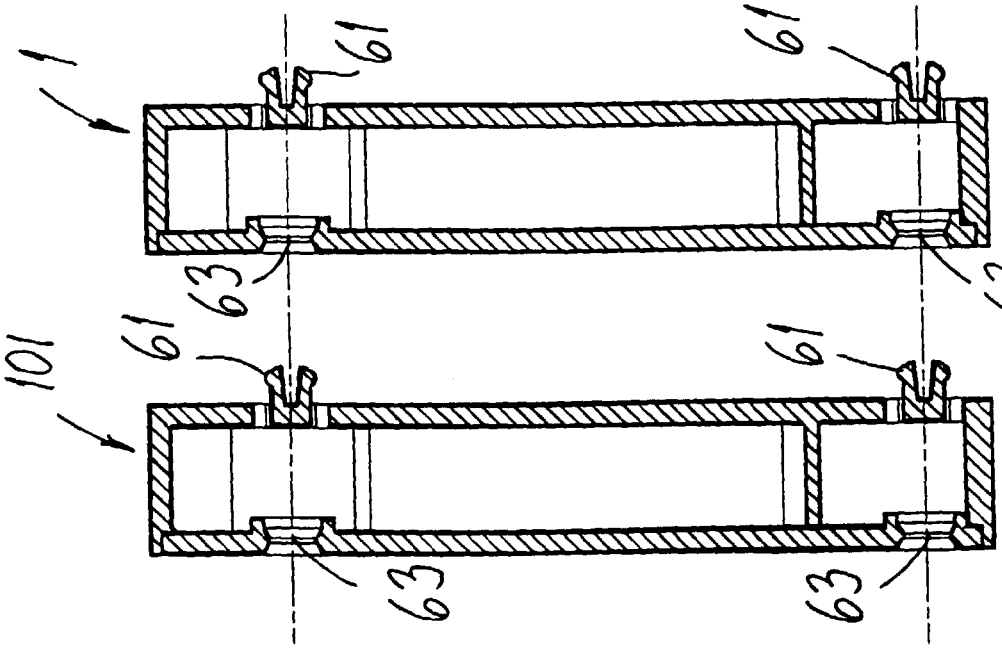

FIG. 17

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 11 0341

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Y	DE 79 00 929 U (LICENTIA PATENT-VERWALTUNGS-GMBH) 19 June 1980 (1980-06-19) * page 4, line 16 - page 5, line 27; figures 1-3 *	2	
A	EP 0 717 426 A (BTICINO SPA) 19 June 1996 (1996-06-19) * column 4, line 13 - line 31; figure 1 *	3,4	
Y	EP 0 081 805 A (LICENTIA GMBH) 22 June 1983 (1983-06-22) * page 4, line 10 - line 16; figure 1 *	5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7) H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	1 August 2000	Ramírez Fueyo, M

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 11 0341

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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01-08-2000

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