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

(11) EP 1 261 010 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.11.2002 Bulletin 2002/48

(51) Int Cl.[7]: **H01H 83/12**, H01H 83/20

(21) Application number: **02011244.7**

(22) Date of filing: **22.05.2002**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **22.05.2001 IT MI20011070**

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

(72) Inventors:
- **Bosatelli, Domenico**
  24069 Cenate Sotto (Bergamo) (IT)
- **Contardi, Augusto**
  21100 Verese (IT)
- **Pianezzola, Sergio**
  21100 Calcinate del Pesce (Varese) (IT)

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

(54) **Auxiliary device for a magnetothermal circuit breaker**

(57) An auxiliary device for a magnetothermal circuit breaker, comprising an electrical protection unit that cooperates, by means of a mechanism, with an opening slider biased by a return spring, in order to define a release position, in which the electrical protection unit actuates the mechanism and releases the slider, which acts on the safety opening mechanism of the circuit breaker, and a rearming position, in which the spring is rearmed. The mechanism has a single actuation lever in which a first end cooperates with the electrical protection unit and a second end cooperates with the slider.

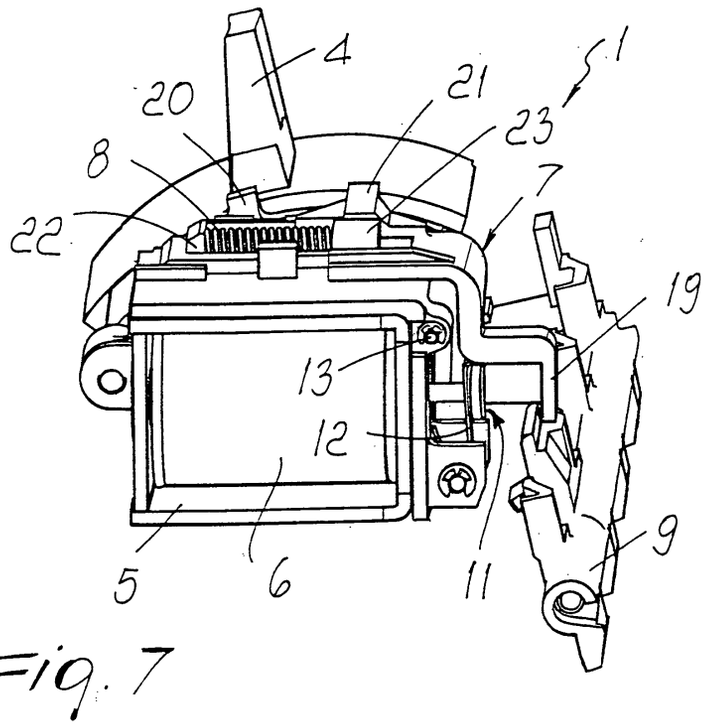


Fig. 7

EP 1 261 010 A1

Description

[0001] The present invention relates to an auxiliary device for a magnetothermal circuit breaker.

[0002] It is known that automatic circuit breakers are provided with auxiliary devices capable of remote-controlling the safety opening of the circuit breakers following a dangerous voltage drop.

[0003] These auxiliary devices are constituted by the undervoltage trip release or, as an alternative, by the shunt trip release, and are installed in an appropriately provided compartment formed frontally with respect to the containment body of the enclosed circuit breaker, so as to actuate, if tripping occurs, the release lever that actuates the mechanism for the safety opening of the enclosed circuit breaker.

[0004] In the design of auxiliary devices it is particularly important to simplify their structure in order to optimize their operation and their manufacturing process.

[0005] The aim of the present invention is to provide an auxiliary device for enclosed circuit breaker that is improved with respect to the prior art devices.

[0006] An object of the invention is to provide a device that is constructively simple and has a small number of components.

[0007] Another object is to provide a device that offers the greatest assurance of safety and reliability.

[0008] This aim, these objects and others that will become better apparent hereinafter are achieved by an auxiliary device for a circuit breaker, as claimed in the appended claims.

[0009] Further characteristics and advantages of the present invention will become better apparent from the description of preferred but not exclusive embodiments thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a perspective view of the front of an enclosed circuit breaker, illustrating an auxiliary undervoltage trip release device, according to the invention, in a step of its installation in the appropriately provided compartment;

Figure 2 is a view, similar to Figure 1, of the device installed in the enclosed circuit breaker;

Figures 3 and 4 are respectively a schematic perspective view of an auxiliary undervoltage trip device applied to the circuit breaker mechanism and a side elevation view of the undervoltage trip device, shown in the condition in which the undervoltage trip device is engaged and ready to trip;

Figures 5 and 6 are respectively a schematic perspective view of an auxiliary undervoltage trip device applied to the circuit breaker mechanism and a side elevation view of the undervoltage trip device, shown in the condition in which the undervoltage trip device is released;

Figures 7 and 8 are respectively a schematic perspective view of an auxiliary undervoltage trip device applied to the mechanism of the circuit breaker and a side elevation view of the undervoltage trip device, shown in the condition in which the automatic circuit breaker is released;

Figures 9 and 10 are respectively a schematic perspective view of an auxiliary undervoltage trip device applied to the circuit breaker mechanism and a side elevation view of the undervoltage trip device, shown in the step of rearming the undervoltage trip device and the automatic circuit breaker;

Figure 11 is a front perspective view of an auxiliary shunt trip release device according to the invention;

Figure 12 is a rear perspective view of the device of Figure 11;

Figure 13 is a sectional front elevation view of the device of Figure 11;

Figure 14 is a sectional rear elevation view of the device of Figure 11, showing schematically the action on the circuit breaker.

[0010] With reference to the above cited figures, an auxiliary device for circuit breakers, generally designated by the reference numeral 1 or 100 and represented by an undervoltage trip release 1 or by a shunt trip release 100, is adapted to remote-control the opening of a circuit breaker.

[0011] With particular reference to Figures 1 to 10, the undervoltage trip device 1 is installed frontally on a containment body 2 of the enclosed circuit breaker in a compartment 3 provided to the side of an activation lever 4 by removing the front cover.

[0012] The device 1 comprises a supporting structure 5, which accommodates an electrical protection unit 6 and with which an opening slider 7 is slidingly associated in an upper region.

[0013] The electrical protection unit 6, as a consequence of tripping caused by a voltage drop, releases the opening slider 7 which, by being affected by a return spring 8, acts on a safety release lever 9 of an enclosed circuit breaker, causing the consequent snap opening of the contacts. By virtue of a rearming mechanism, the slider 7 is returned into position, loading the spring 8.

[0014] According to the invention, the electrical protection unit acts on the slider by means of a single actuation lever 10, as described in greater detail hereinafter.

[0015] The electromagnetic moving core of the electrical protection unit 6 is constituted by a piston 11 which, in the condition in which the device has not tripped, as shown in Figures 3 and 4, is in its innermost sliding position with respect to the fixed electromagnetic component although the action of a contrast spring 12 rigidly coupled to the supporting structure 5 constantly actuates it outward.

[0016] The actuation lever 10, pivoted to the structure 5 in the pivot 13, is kept in position by a contrast spring 14, so that a first end 15 abuts against a larger-diameter actuation portion 16 of the piston 11 and a second end

17 prevents the opening slider 7 from releasing under the action of the return spring 8.

[0017] The end 17 of the actuation lever 10 in fact has a sort of pawl that engages a locking tab 18 of the slider 7, which is shaped like a tooth.

[0018] When the device 1 trips in order to open the circuit breaker, as shown in Figures 5 and 6, the contrast spring 12 keeps the piston outside if the magnetic field of the coil is not activated.

[0019] The actuation portion 16 therefore moves the actuation lever 10, turning it clockwise, despite the reaction of the contrast spring 14, allowing the disengagement of the locking tab 18 from the second end 17 of the actuation lever 10.

[0020] The slider 7 moves with a snap action toward the piston 11, pushed by the spring 8, which is released, actuating the release lever 9 by means of an actuation surface 19, producing the snap action of the activation lever 4 and simultaneously the safety opening of the enclosed circuit breaker, in a per se known manner.

[0021] The slider 7 ends its stroke by abutting against the piston 11 in order to return it into the initial position before tripping, as shown in Figures 7 and 8. Also, the actuation lever 10 can be returned into position by the contrast spring 14 by virtue of the retraction of the piston 11.

[0022] From the position shown in Figures 7 and 8, the activation lever 4 is turned in order to rearm the mechanism of the enclosed circuit breaker. The lever 4 is provided with a lug 20 that abuts, during movement, against a rearming lug 21 that protrudes from the main body of the slider 7 and is made to slide outward.

[0023] The spring 8 is then tensioned between an abutment tooth 22 of the slider 7 and a portion 23 that is rigidly coupled to the supporting structure 5, so that it is loaded.

[0024] Simultaneously, the locking lug 18 slides on the passive side of the second end 17 of the actuation lever 10, so as to engage the active portion of its pawl, by virtue of the contrast spring 14, which keeps in position the actuation lever 10 when the slider reaches the end of its stroke.

[0025] The auxiliary device can be constituted by a shunt trip release, which can be installed as an alternative to the undervoltage trip release.

[0026] With particular reference to Figures 11 to 14, the shunt trip release device 100 comprises a containment body 101 that accommodates an electrical protection unit 102 whose electromagnetic moving core is constituted by a piston 103 and a circuit breaker 104 that automatically deactivates the electrical protection unit 102 when the circuit breaker is open.

[0027] When the device is not activated, the piston 103 is in the outermost position with respect to the electromagnetic fixed core of the electrical protection unit 102, with its head proximate to the release lever 105 of the enclosed circuit breaker.

[0028] When the device 100 is activated by an external impulse, the piston 103 is drawn toward the inside of the fixed core, actuating the release lever 105 and consequently opening the enclosed circuit breaker. The piston 103 is returned into its position by a return spring 106, in the specific case a helical spring, which is arranged in a cavity of the internal end 107 of the piston 103 and in contrast with the fixed core and is compressed during the movement of the piston 103.

[0029] The circuit breaker 104 is constituted by a member that can slide vertically along a seat formed in the containment body 101, with one end associated with a horizontal support 108 on which two contacts 109 are fixed in series to the winding 110 of the electrical protection unit 102. In the condition in which the device 100 is ready for tripping, the contacts 109 are closed on the winding 110 by a helical spring 111, which in contrast between the horizontal support 108 and an abutment portion 112 formed in the containment body 101, actuates the circuit breaker 104 downward.

[0030] The intervention of the device 110, as described above, causes the opening of the moving contact lever 113 of the enclosed circuit breaker, which by abutting against the lower end of the circuit breaker 104 makes it slide upward, opening the contacts 109, deactivating the device 100, until the moving contact lever 113 remains in the position in which the enclosed circuit breaker is open.

[0031] In practice it has been observed that the invention achieves the intended aim and objects, an auxiliary device for circuit breaker having been provided which is particularly simple from a constructive point of view, is reliable, and has a reduced tripping time.

[0032] The device according to the invention is susceptible of numerous modifications and variations, within the scope of the appended claims. All the details may furthermore be replaced with technically equivalent elements.

[0033] 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. An auxiliary device for a circuit breaker, comprising an electrical protection unit that cooperates, by means of a mechanism, with an opening slider biased by a return spring, in order to define a release position, in which said electrical protection unit actuates said mechanism and releases said slider, which acts on the safety opening mechanism of said circuit breaker, and a rearming position, in which said spring is rearmed, **characterized in that** said mechanism comprises a single actuation lever in which a first end cooperates with said electrical protection unit and a second end cooperates with said slider.

2. The device according to claim 1, **characterized in that** an electromagnetic moving core of said electrical protection unit comprises a piston which, in the condition in which the device has not tripped, is in its innermost sliding position with respect to a fixed electromagnetic component of said electrical protection unit, contrasting the actuation of a first contrast spring, said contrast spring being rigidly coupled to said supporting structure and actuating said piston constantly outward.

3. The device according to claim 1 or 2, **characterized in that** said actuation lever, pivoted to said structure, is kept in position by a second contrast spring, said actuation lever having a first end that abuts against an actuation portion of said piston and a second end that engages a locking lug of said slider.

4. The device according to one or more of the preceding claims, **characterized in that** in tripping conditions said piston is moved outward by said first contrast spring, said actuation portion producing the clockwise rotation of said actuation lever, allowing the disengagement of said locking lug from said second end of said actuation lever, said slider moving with a snap action toward said piston, being pushed by the release of said return spring, said slider, by means of an actuation surface, actuating said release lever, causing the consequent safety opening of the circuit breaker and the snap action of said activation lever.

5. The device according to one or more of the preceding claims, **characterized in that** said slider ends its stroke by abutting against said piston in order to return said piston into the initial position prior to tripping, said actuation lever, by means of the retraction of said piston, being returned in position by said second contrast spring.

6. The device according to one or more of the preceding claims, **characterized in that** said activation lever is turned in order to rearm the mechanism of the circuit breaker that has tripped due to the intervention of said device, said handle being provided with a lug that abuts, during movement, against a rearming lug that protrudes from the main body of said slider and is made to slide outward, said spring being tensioned between an abutment tooth of said slider and a portion that is rigidly coupled to said supporting structure, so that it is loaded, said locking lug sliding on the passive side of the second end of said actuation lever, engaging on said active portion thereof, by means of said contrast spring, which maintains said actuation lever in position when said slider reaches the end of its stroke.

7. An auxiliary device for circuit breaker, comprising a containment body that contains an electrical protection unit which, if tripping occurs, actuates the mechanism for the safety opening of a circuit breaker, **characterized in that** it comprises a circuit breaker that automatically deactivates said electrical protection unit when the circuit breaker is open, said circuit breaker being activated by the opening moving contact of said circuit breaker.

8. The device according to claim 7, **characterized in that** the electromagnetic moving core of said electrical protection unit is constituted by a piston which, in the tripped condition of said device, turns the release lever of said circuit breaker, opening said moving contact, said piston being returned into position by a return spring actuated during tripping.

9. The device according to claim 7 or 8, **characterized in that** said circuit breaker of said device is constituted by a member that can slide vertically along a seat formed in said containment body, said sliding member having an end that is associated with a horizontal support on which contacts are fixed in series to the magnetic winding of said electrical protection unit.

10. The device according to one or more of claims 7 to 9, **characterized in that** in the condition in which the device is ready for tripping, said contacts are closed on said winding by means of a helical spring, said spring being in contrast between said horizontal support and an abutment portion of said containment portion, actuating said circuit breaker downward.

11. The device according to claims 7 to 10, **characterized in that** said opening moving contact abuts against the lower end of said circuit breaker, forcing it to slide upward, opening said contacts and deactivating said device, until said moving contact remains in the position in which the circuit breaker is open.

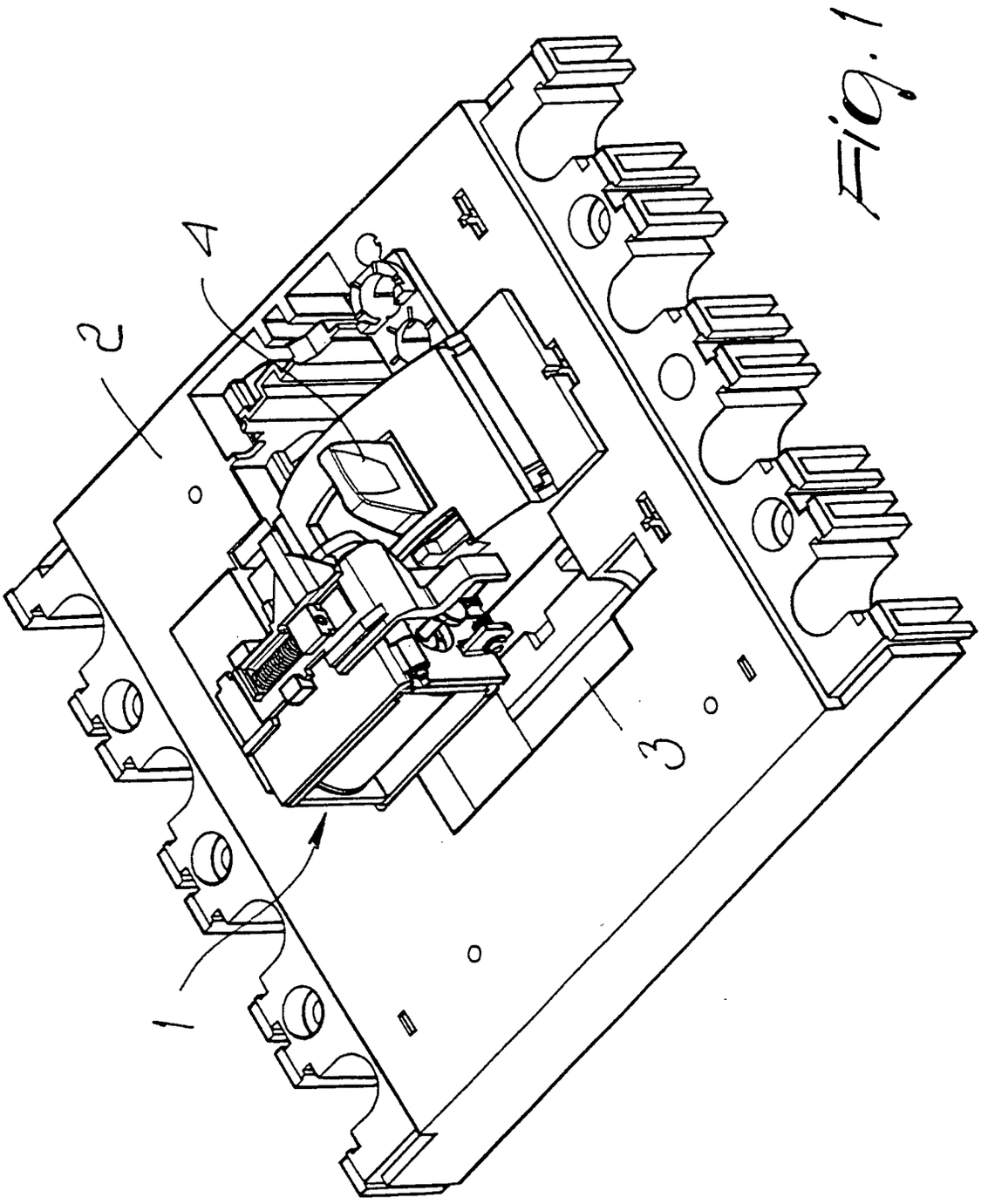
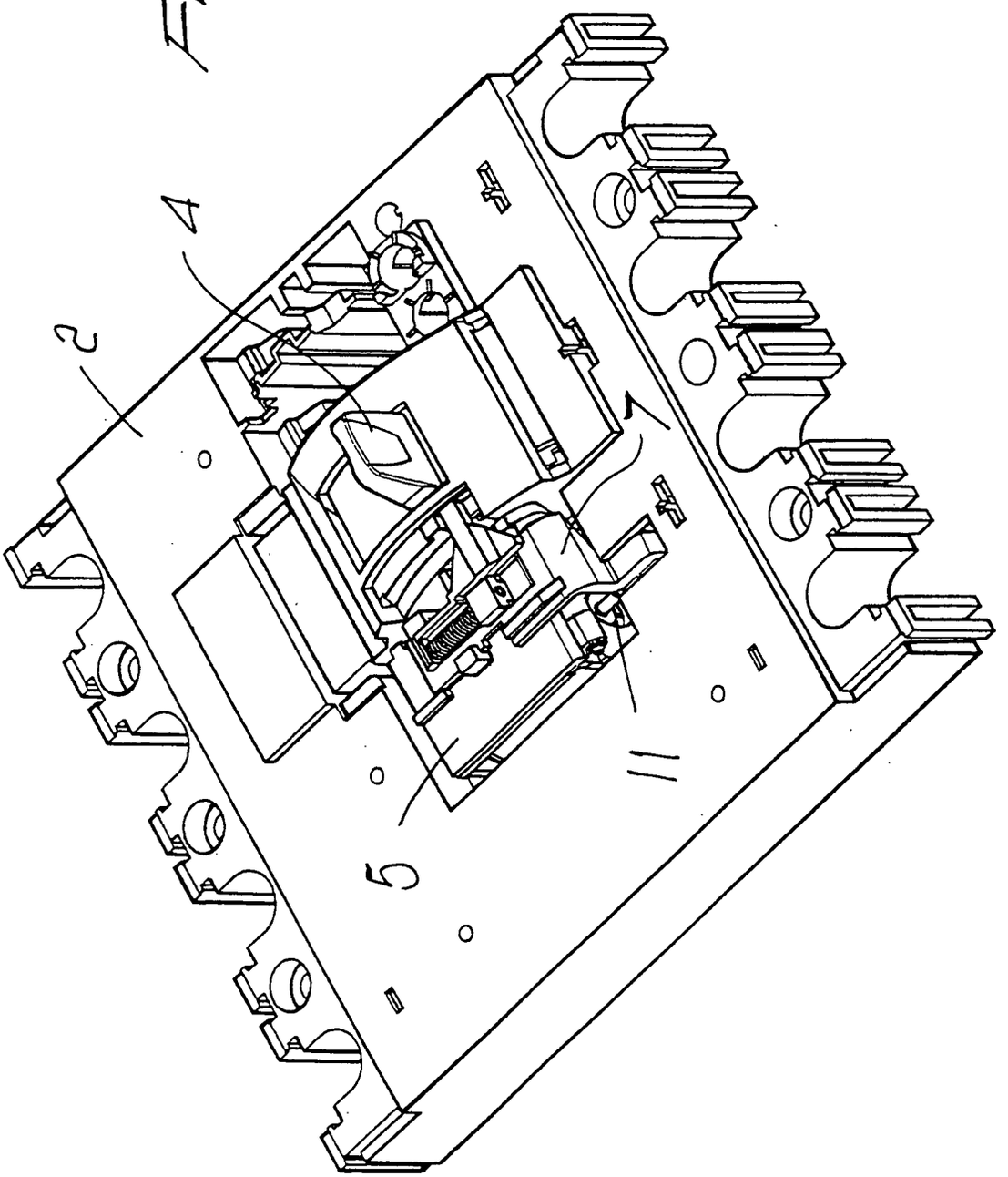


Fig. 1

Fig. 2



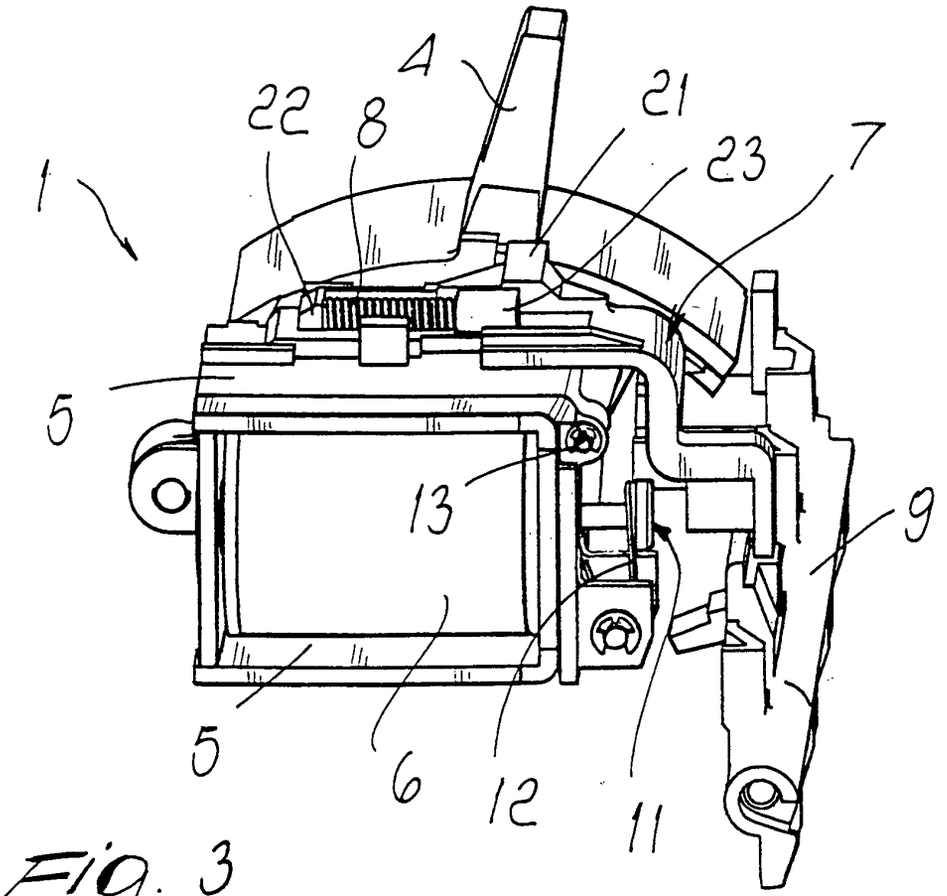


Fig. 3

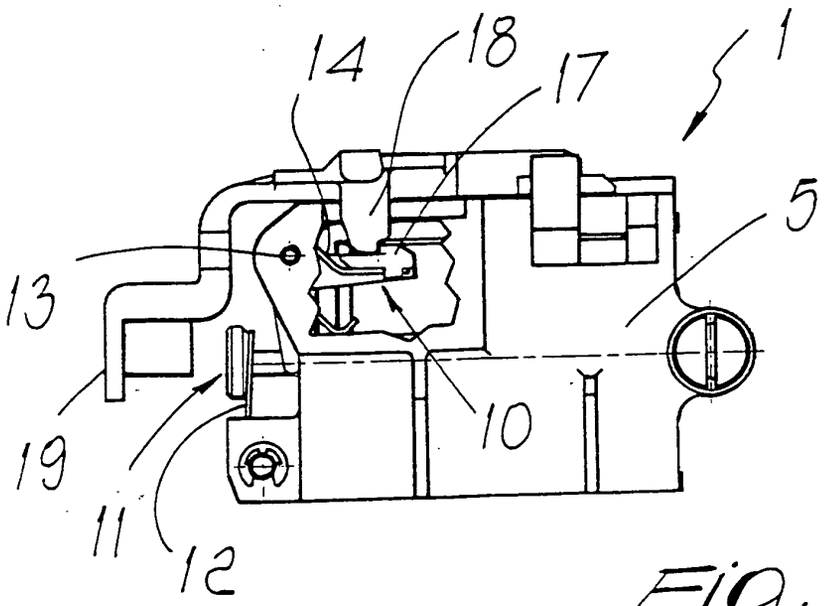


Fig. 4

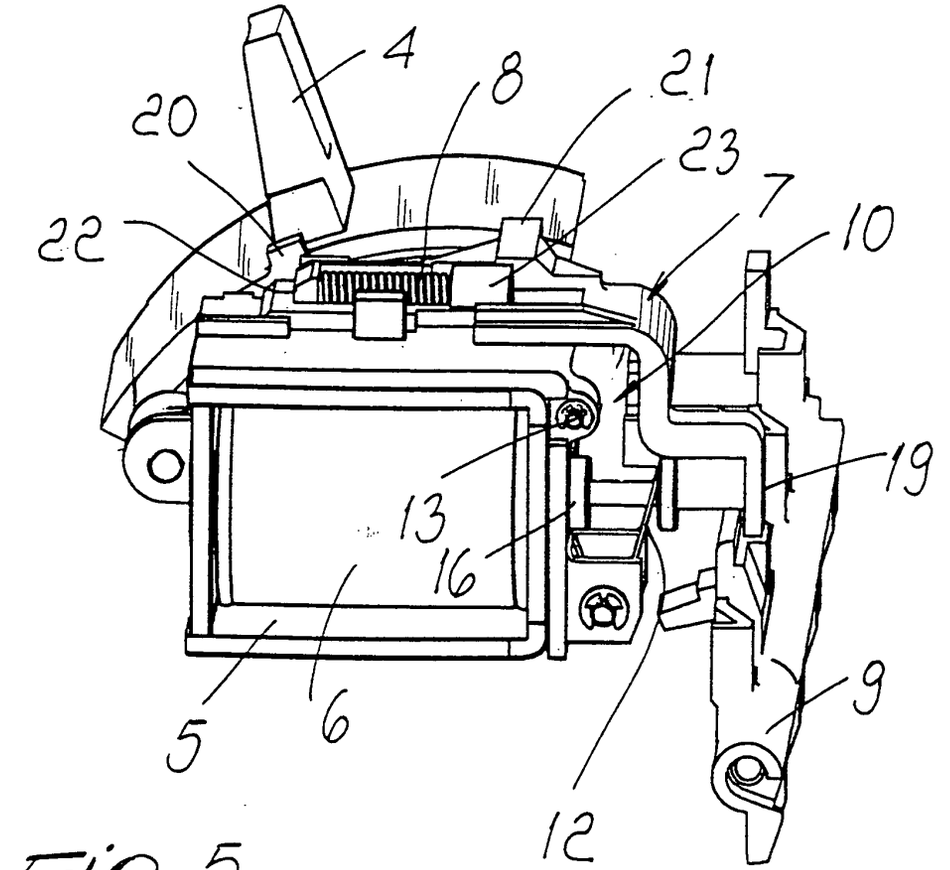


Fig. 5

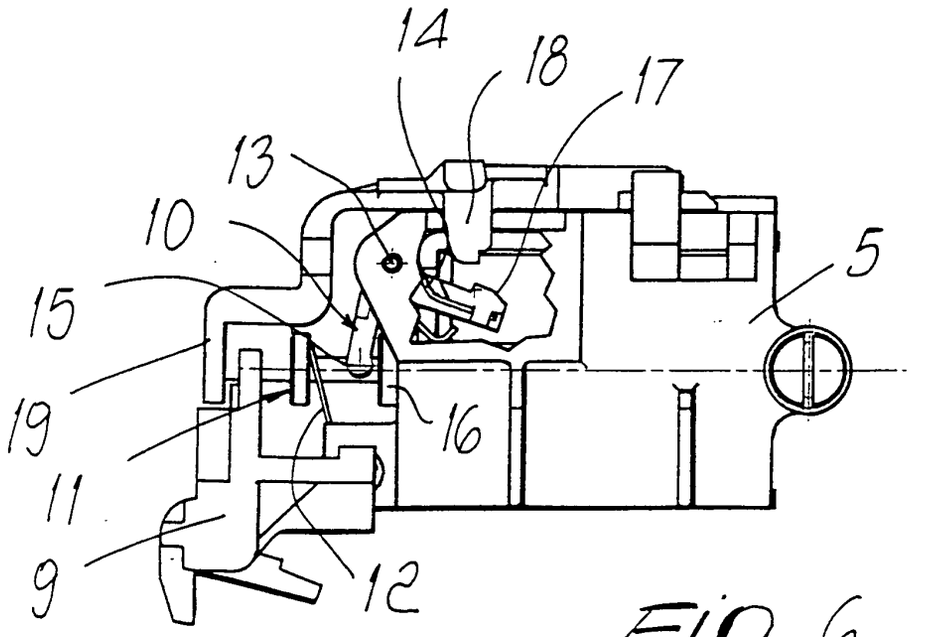


Fig. 6

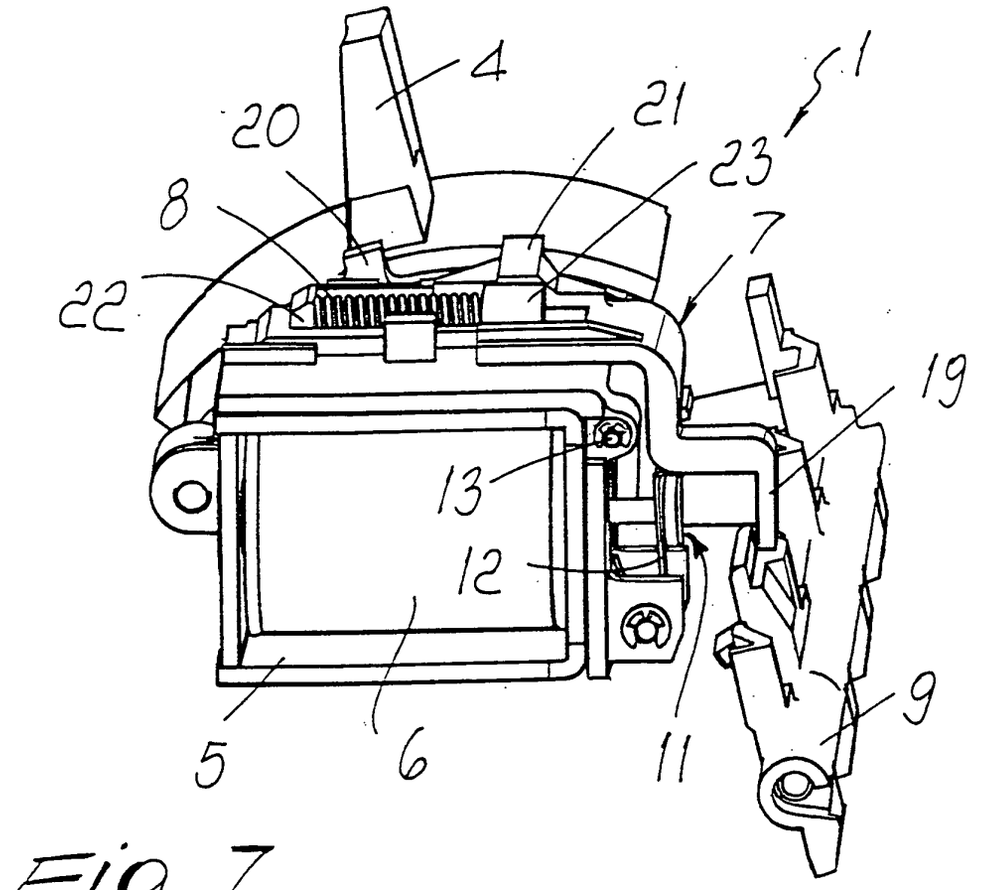


Fig. 7

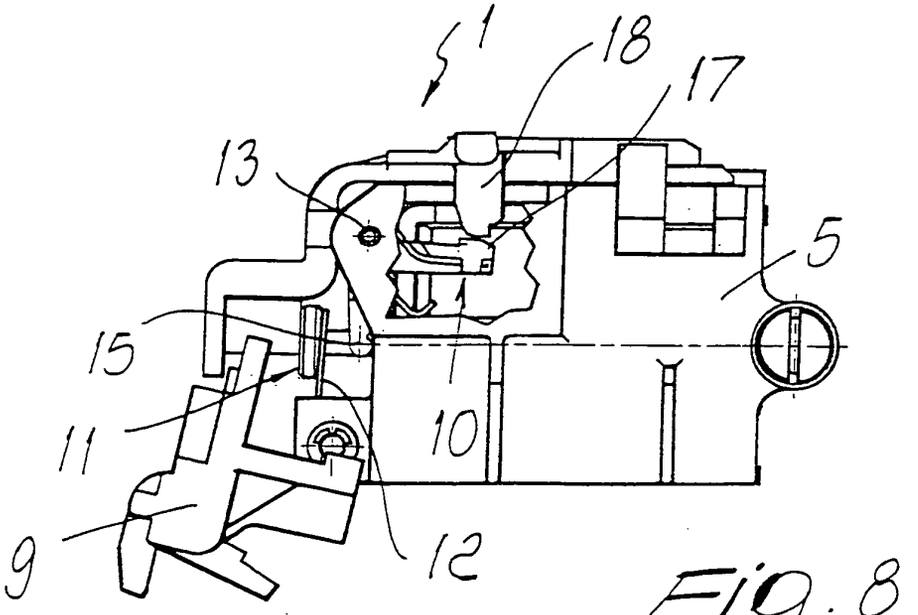


Fig. 8

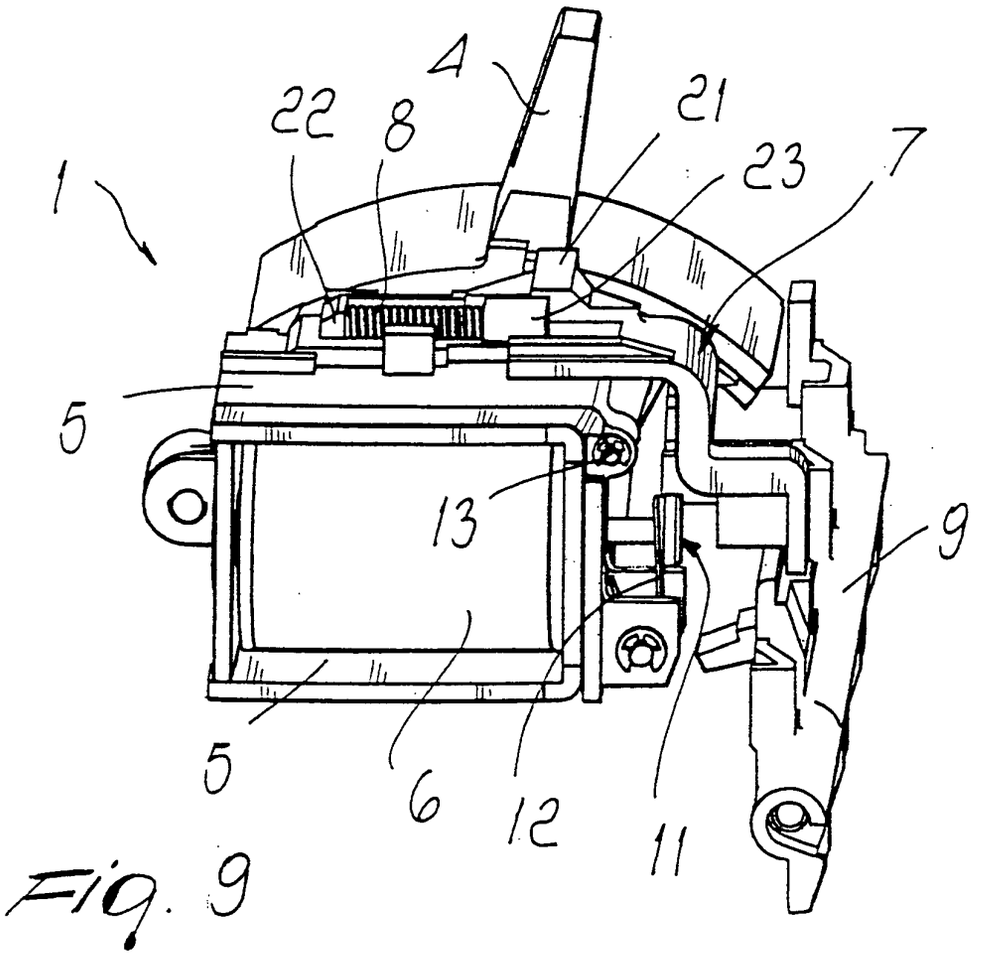


Fig. 9

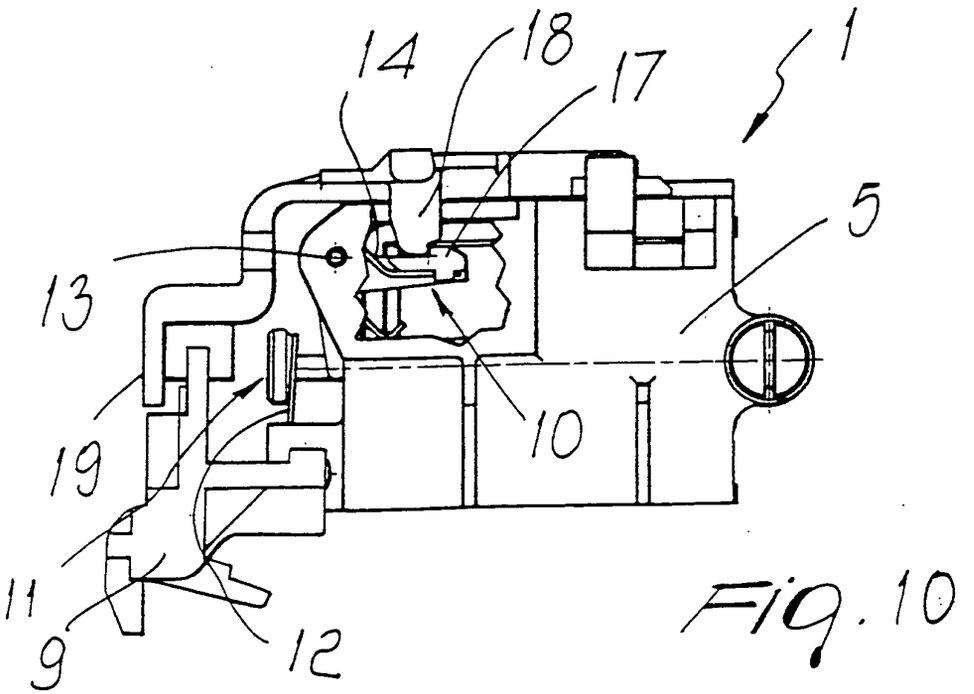


Fig. 10

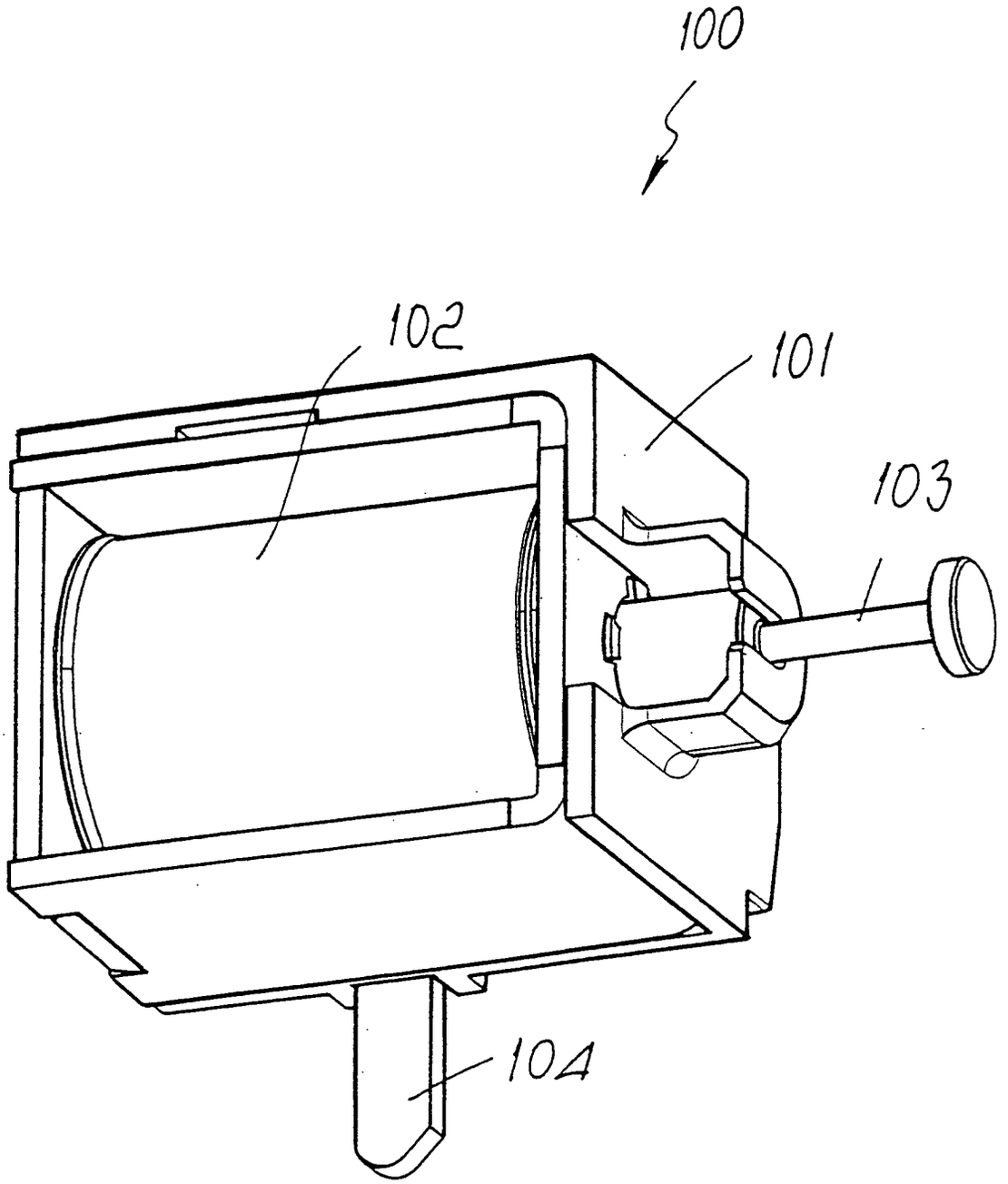


Fig. 11

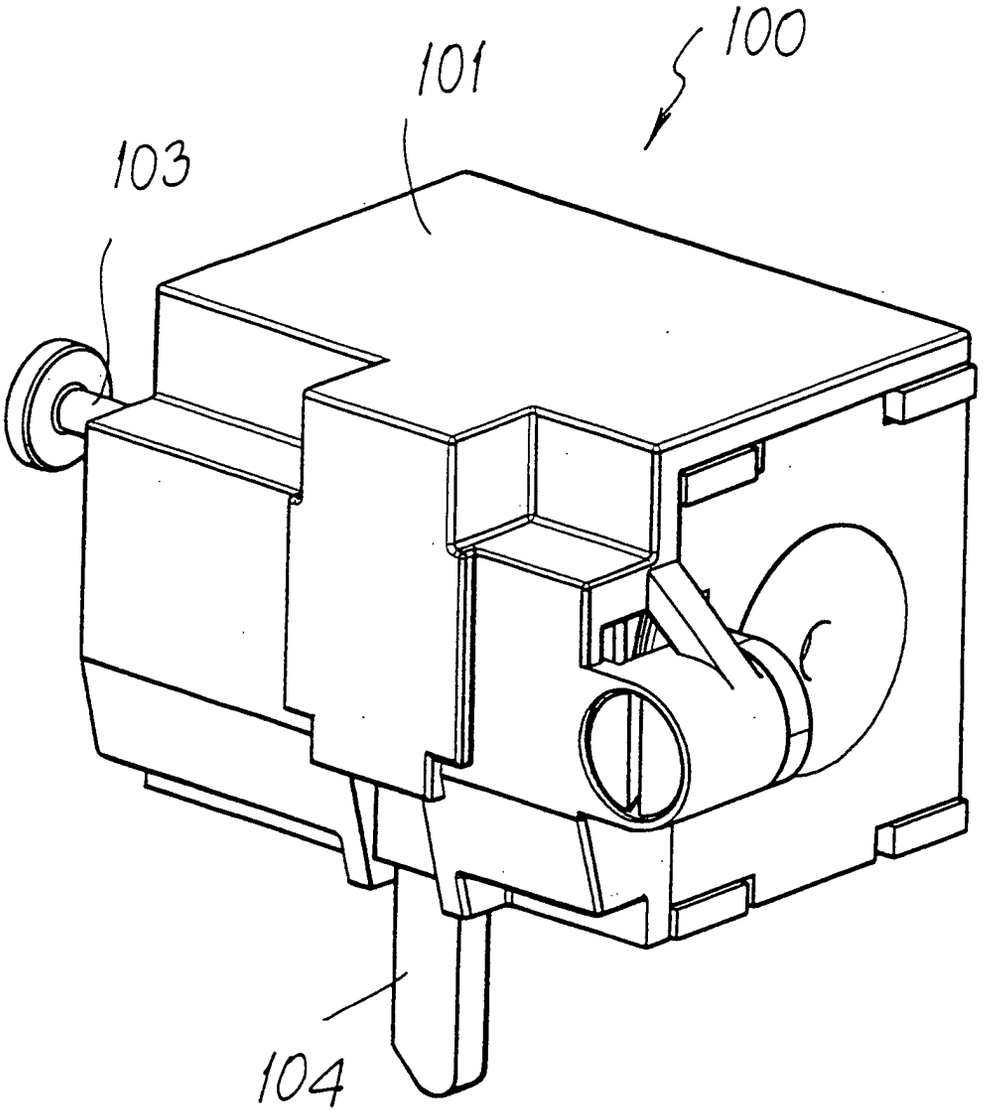


Fig. 12

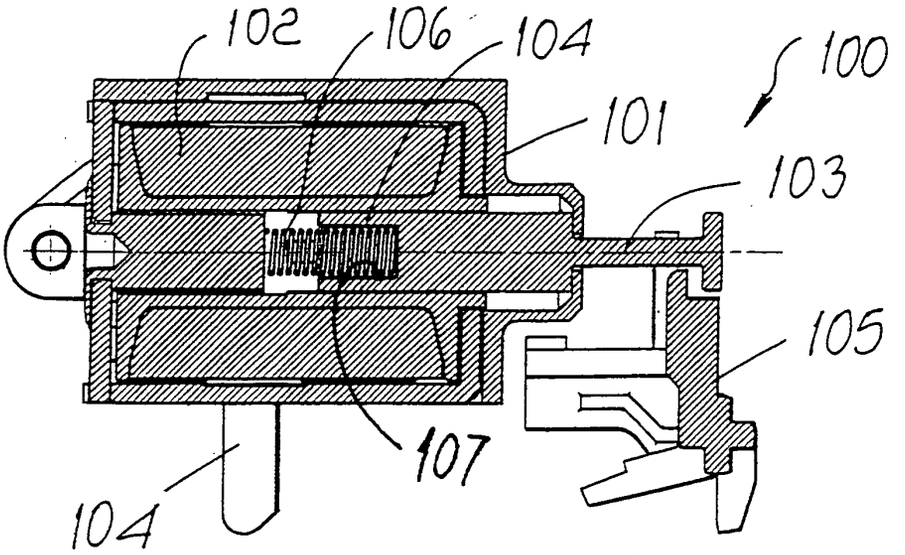

102
106
104
100
101
103
105
107
104

FIG. 13

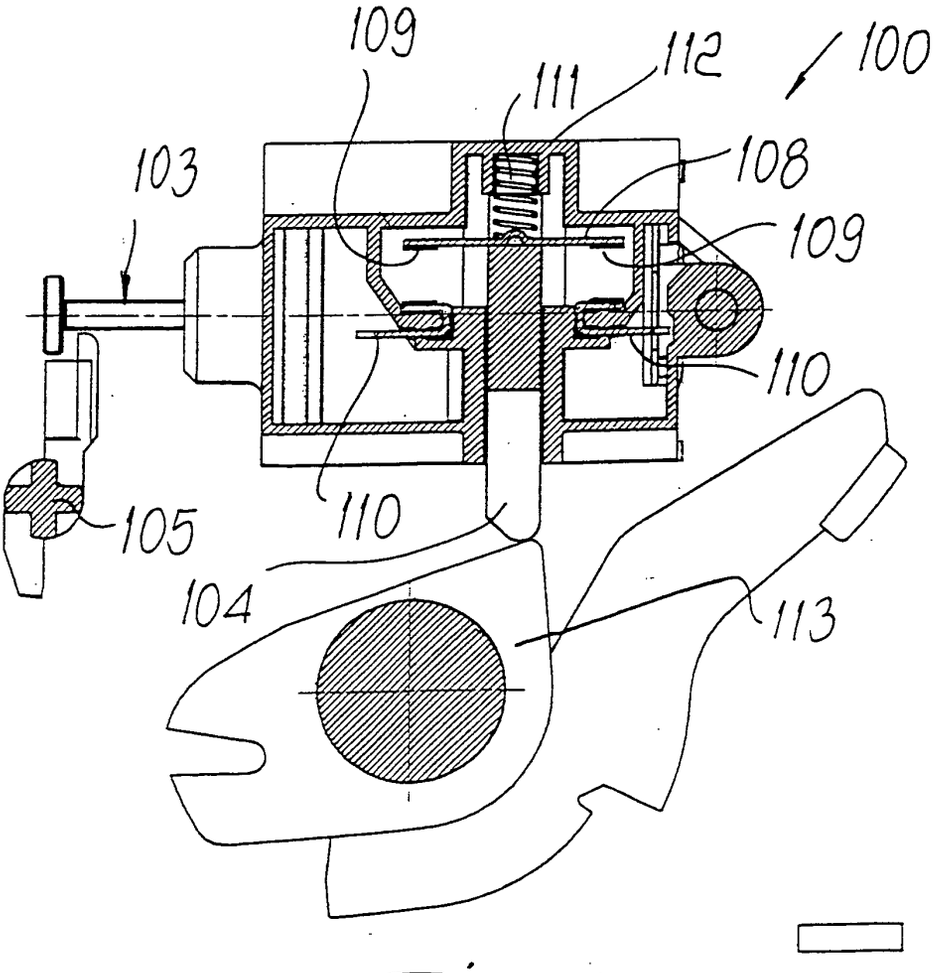

109
111
112
100
103
108
109
110
105
110
104
113

FIG. 14

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 01 1244

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)
A	US 3 919 674 A (ACAMPORA VINCENT PAUL ET AL) 11 November 1975 (1975-11-11) * column 4, line 3 - column 6, line 2 *	1-6	H01H83/12 H01H83/20
A	US 4 297 663 A (SEYMOUR RAYMOND K ET AL) 27 October 1981 (1981-10-27) * column 4, line 27 - column 5, line 68 *	1-6	
X		7-11	

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	26 August 2002	Libberecht, L

CATEGORY OF CITED DOCUMENTS

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

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

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 01 1244

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

26-08-2002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3919674 A	11-11-1975	CA 1035815 A1	01-08-1978
US 4297663 A	27-10-1981	NONE	

EPO FORM P0459

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