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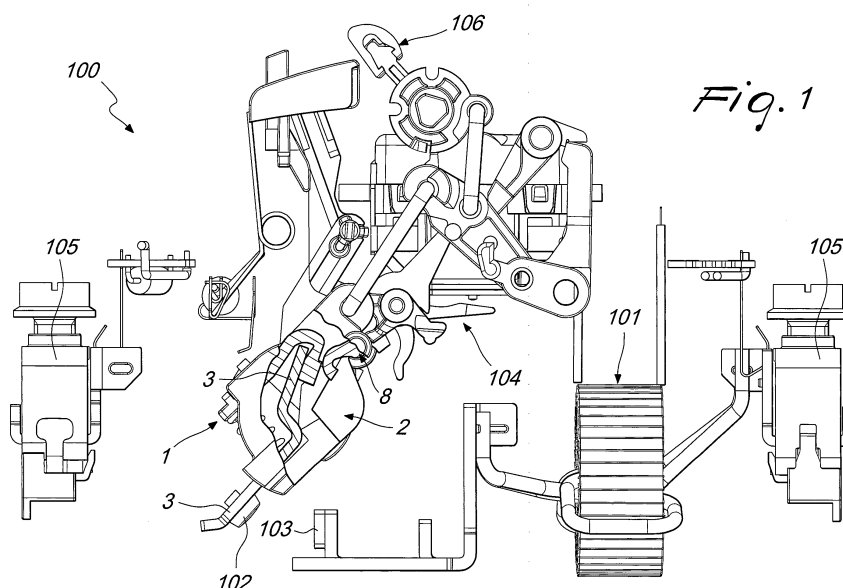
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(54) **Contact closing device for a switch**

(57) A contact closing device for a switch having at least one movable contact, at least one fixed contact, and a contact mechanism actuated by an operating handle; a contact holder lever supports one or more movable contacts; the contact holder lever has a rotational motion between an open contact position and a closed contact position; each movable contact has an oscillating motion within a respective seat formed in the contact holder lever; a tripping lever is associated with the contact holder lever and is adapted to actuate the oscillating motion of each movable contact; each movable contact is fitted in the respective seat together with a respective spring and a respective tripping blade; each tripping blade is en-

gaged by the tripping lever during a portion of the rotational motion from the open contact position to the closed contact position; during this portion of rotational motion the tripping blade blocks at least partially the movement of the movable contact and the spring undergoes a compression; at the end of the portion of rotational motion the tripping blade disengages from the tripping lever, leaving the movable contact free to contact the fixed contact by virtue of the action of the spring. The trip blade is fitted inside the seat of the contact holder lever and is provided with an end adapted to be engaged by the trip lever fitted on said contact holder lever.



Description

[0001] The present invention relates to a contact closing device for a switch.

[0002] Electrical switches are known which use mechanisms that allow to open and close a plurality of movable contacts in parallel and synchronously by operating an external handle that can be accessed by the user and by the automatic intervention of the protection devices provided in the switch.

[0003] Some switches are provided with devices that allow to render the contact closure speed independent of the speed of operation of the handle.

[0004] It is in fact preferable that the contacts close instantaneously, to prevent dangerous effects such as the onset of an electric arc between the approaching contacts.

[0005] FR-2717617 and EP2061060 disclose electrical switches provided with systems that ensure a rapid contact closure.

[0006] FR2686453 discloses a differential switch having a rapid-disengaging mechanism in a box, between an operating handle and a contact support.

[0007] The two constant problems in the design of these switches are the complexity of the mechanisms and the dimensions.

[0008] There is a constant need of simplifying the mechanisms, from the constructive standpoint, in order to make production economical and it is also very important to make the assembling simple and automated.

[0009] Another fundamental problem is to improve the performance of switches while maintaining small dimensions and in any case within standards.

[0010] The aim of the present invention is to provide a device for closing the contacts of a switch that ensures a rapid closure that is independent of the operating speed of the operating handle, with a structure that is simple and that can be produced economically.

[0011] Within the scope of this aim, an object of the invention is to provide a contact closure device that can be used in safety switches such as residual current circuit breakers and magneto-thermal circuit breakers.

[0012] Another object of the present invention is to provide a device which, by virtue of its particular constructive characteristics, is capable of giving the greatest assurances of reliability and safety in use.

[0013] This aim, these objects and others that will become better apparent hereinafter are achieved by a contact closing device for a switch comprising at least one movable contact and at least one fixed contact, said movable contact being operated by means of a mechanism actuated by an operating handle; a contact holder lever supporting one or more movable contacts; said contact holder lever having a rotational motion between an open contact position and a closed contact position; each of said movable contacts having an oscillating motion within a respective seat formed in said contact holder lever; a tripping lever associated with said contact holder lever

and adapted to actuate the oscillating motion of each movable contact; said closing device being characterized in that each movable contact is fitted in said respective seat together with a respective spring and a respective trip blade; each trip blade being engaged by said trip lever during a portion of said rotational motion of said trip lever from said open contact position to said closed contact position; during said portion of rotational motion said trip blade blocking at least partially the movement of said movable contact and said spring undergoing a compression; at the end of said portion of rotational motion, said trip blade disengages from said trip lever, thus leaving said movable contact free to contact said fixed contact by the action of said spring; said trip blade is fitted inside said seat of said contact holder lever and has an end adapted to be engaged by said trip lever fitted on said contact holder lever.

[0014] Further characteristics and advantages will become better apparent from the description of preferred but not exclusive embodiments of the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a side view of a residual current circuit breaker, shown in the open contact condition;
Figure 2 is a view, similar to the preceding one, showing the breaker in a contact closure step;
Figure 3 is a view, similar to the preceding one, showing the breaker in the closed contact condition;
Figure 4 is an exploded perspective view of the closure device according to the present invention;
Figure 5 is a perspective view of the closure device in the assembled condition.

[0015] With reference to the cited figures, the contact closing device, according to the invention, generally designated by the reference numeral 1, is described here within a residual current circuit breaker, generally designated by the reference numeral 100, which includes a residual current circuit 101, constituted by a relay and a differential transformer. The residual current circuit 101 is adapted to actuate the movement of at least one movable contact 3 with respect to a fixed contact 103, by virtue of a free tripping mechanism 104, in order to close or open the circuit between two input and output terminals 105.

[0016] The breaker 100 has an actuation handle 106 for the manual actuation of the mechanism 104.

[0017] The mechanism 104 includes the closing device 1, which has at least one contact holder lever 2. A movable contact 3 is fitted in the holder lever 2 and a contact pad 102 is fixed on the movable contact 3.

[0018] The movable contact 3 is constituted by a contact holder arm 31 that blends into a supporting arm 32 by means of a curved portion 33.

[0019] The supporting arm 32 is provided with a slot 34 and a tab 35.

[0020] The movable contact 3 can oscillate within a

respective seat 21 formed in the lever 2, in contrast with a spring 5, which is interposed between the contact holder arm 31 and a spring support 6, which is fitted within the seat 21 of the lever 2.

[0021] The spring support 6 has a protrusion 61 which engages an end of the spring 5. The spring support 6 also has a recess 62 provided with an internal tooth 63 which engages the slot 34 of the movable contact 3.

[0022] A notch 64, provided at the recess 62, engages the tab 35 of the movable contact 3.

[0023] A trip blade 7 is mounted inside the seat 21 of the lever 2 and is provided with an end 71 that is adapted to be engaged by a trip lever 8 fitted on the lever 2.

[0024] The trip lever 8 is provided with a protrusion 81 for each trip blade 7.

[0025] The trip lever 8 also has a trip tab 82 that is moved by a cam 9 that is fitted on the rotation axis of the contact holder lever 2.

[0026] The contact holder lever 2 may include one or more movable contacts, for example two, as in the illustrated example, or four or more.

[0027] The trip lever 8 is a single lever and allows to temporarily lock the moving contacts and to release them at a given instant.

[0028] Each movable contact is provided with a trip blade 7, which engages the trip lever 8, during the closure maneuver, blocking the movement of the respective movable contact 3 in the direction of the fixed contact 103 but releasing the movable contact 3 at a given instant.

[0029] In this step, the upper end of each trip blade 7 is engaged in the respective protrusion 81 of the trip lever 8.

[0030] During the closure maneuver, while the contact holder lever 2 rotates and the movement of the movable contact 3 is blocked, the spring 5 is compressed.

[0031] Upon tripping, i.e., when the trip blade 7 disengages from the trip lever 8, the spring is extended and generates an instantaneous motion of the movable contact 3 toward the fixed contact 103, closing the electric circuit between the terminals on the power supply side and those on the load side.

[0032] Figures 1-3 illustrate the sequence of the movements of the device in passing from the open contact position to the closed contact position due to the maneuver induced by the operating handle 106.

[0033] In practice it has been found that the invention achieves the intended aim and objects, providing a device for closing the contacts of a switch that ensures a contact closure that is independent of the operating speed of the handle of the switch.

[0034] The device according to the present invention is structurally simple and can be produced easily and economically, at the same time ensuring high reliability and durability.

Claims

1. A contact closing device for a switch comprising at least one movable contact and at least one fixed contact, said movable contact being operated by means of a mechanism actuated by an operating handle; a contact holder lever supporting one or more movable contacts; said contact holder lever having a rotational motion between an open contact position and a closed contact position; each of said movable contacts having an oscillating motion within a respective seat formed in said contact holder lever; a tripping lever associated with said contact holder lever and adapted to actuate the oscillating motion of each movable contact; said closing device being **characterized in that** each movable contact is fitted in said respective seat together with a respective spring and a respective trip blade; each trip blade being engaged by said trip lever during a portion of said rotational motion of said trip lever from said open contact position to said closed contact position; during said portion of rotational motion said trip blade blocking at least partially the movement of said movable contact and said spring undergoing a compression; at the end of said portion of rotational motion, said trip blade disengages from said trip lever, thus leaving said movable contact free to contact said fixed contact by the action of said spring; said trip blade is fitted inside said seat of said contact holder lever and has an end adapted to be engaged by said trip lever fitted on said contact holder lever.
2. The device according to claim 1, **characterized in that** said movable contact is constituted by a contact holder arm that is blended into a supporting arm by a curved portion; said supporting arm comprising a slot and a tab.
3. The device according to claim 2, **characterized in that** said movable contact oscillates in said seat formed in said contact holder lever in contrast with said spring; said spring being interposed between said contact holder arm and a spring support fitted within said seat.
4. The device according to claim 3, **characterized in that** it said spring support is provided with a protrusion that engages an end of said spring, and a recess provided with an inner tooth; said inner tooth engaging said slot of said movable contact; a notch being provided at said recess; said notch engaging said tab of said movable contact.
5. The device according to claim 4, **characterized in that** said trip lever comprises one or more protrusions for each of said trip blades.
6. The device according to claim 5, **characterized in**

that said trip lever comprises a trip tab that is moved by a cam fitted on the axis of rotation of said contact holder lever.

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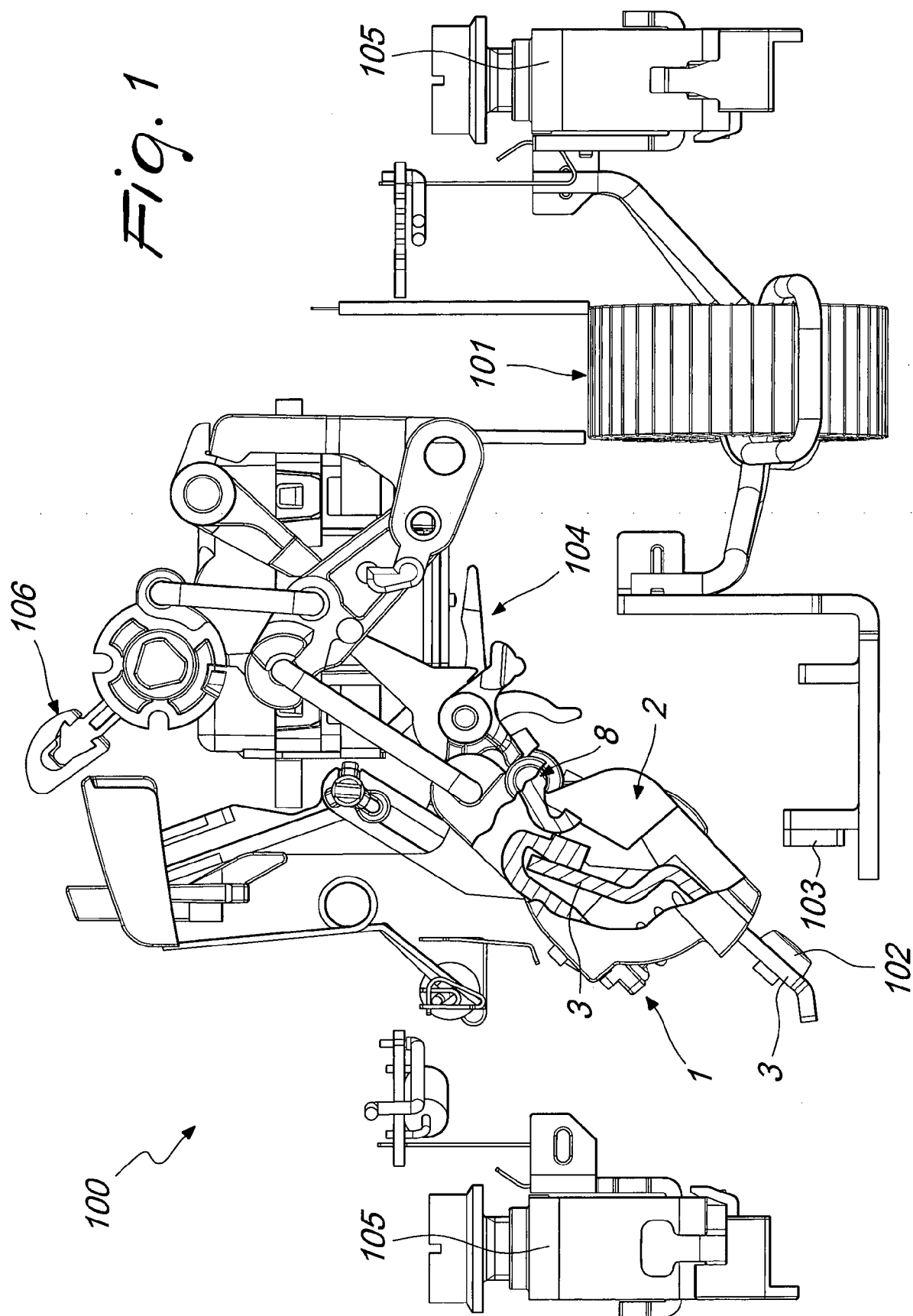
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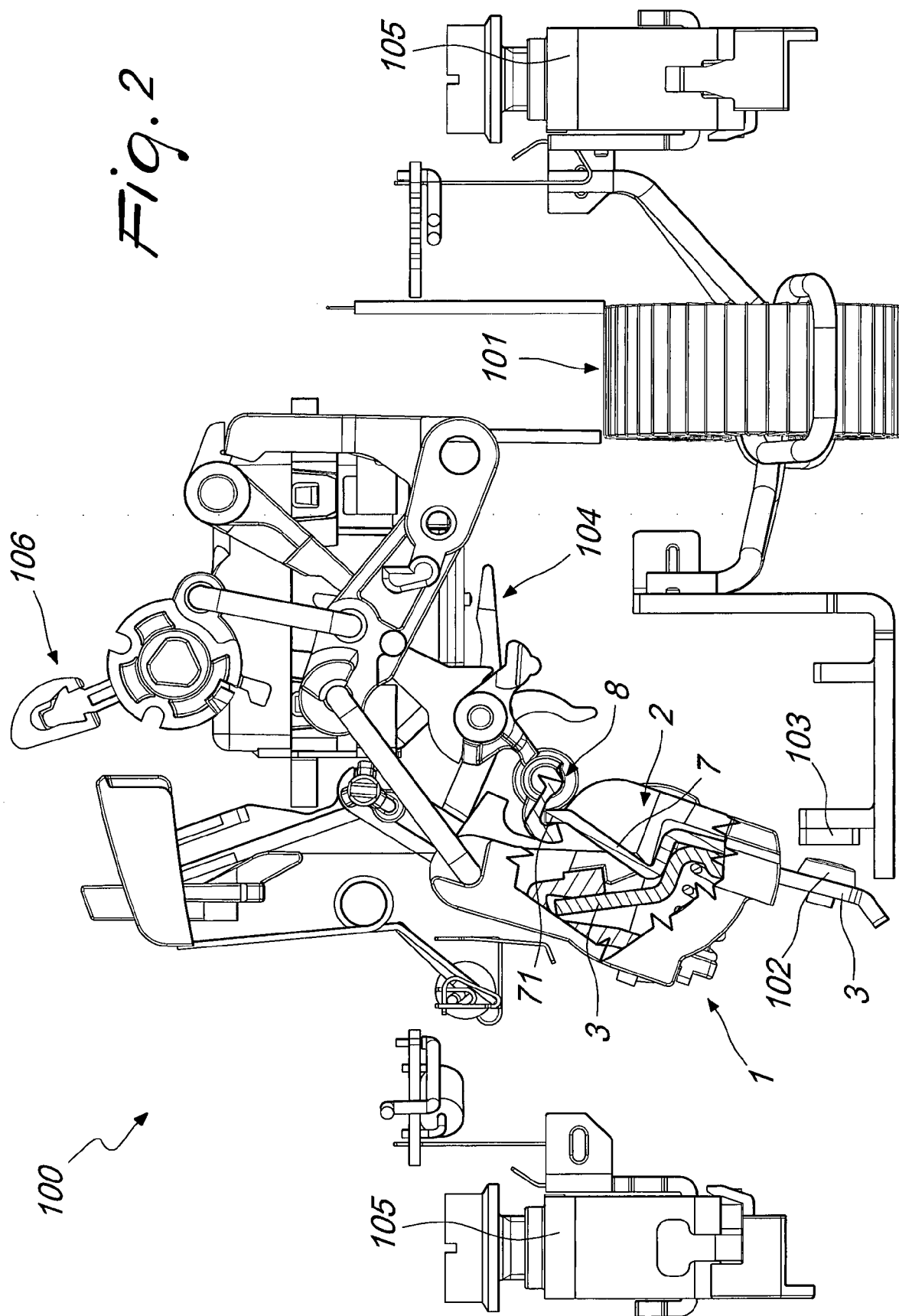
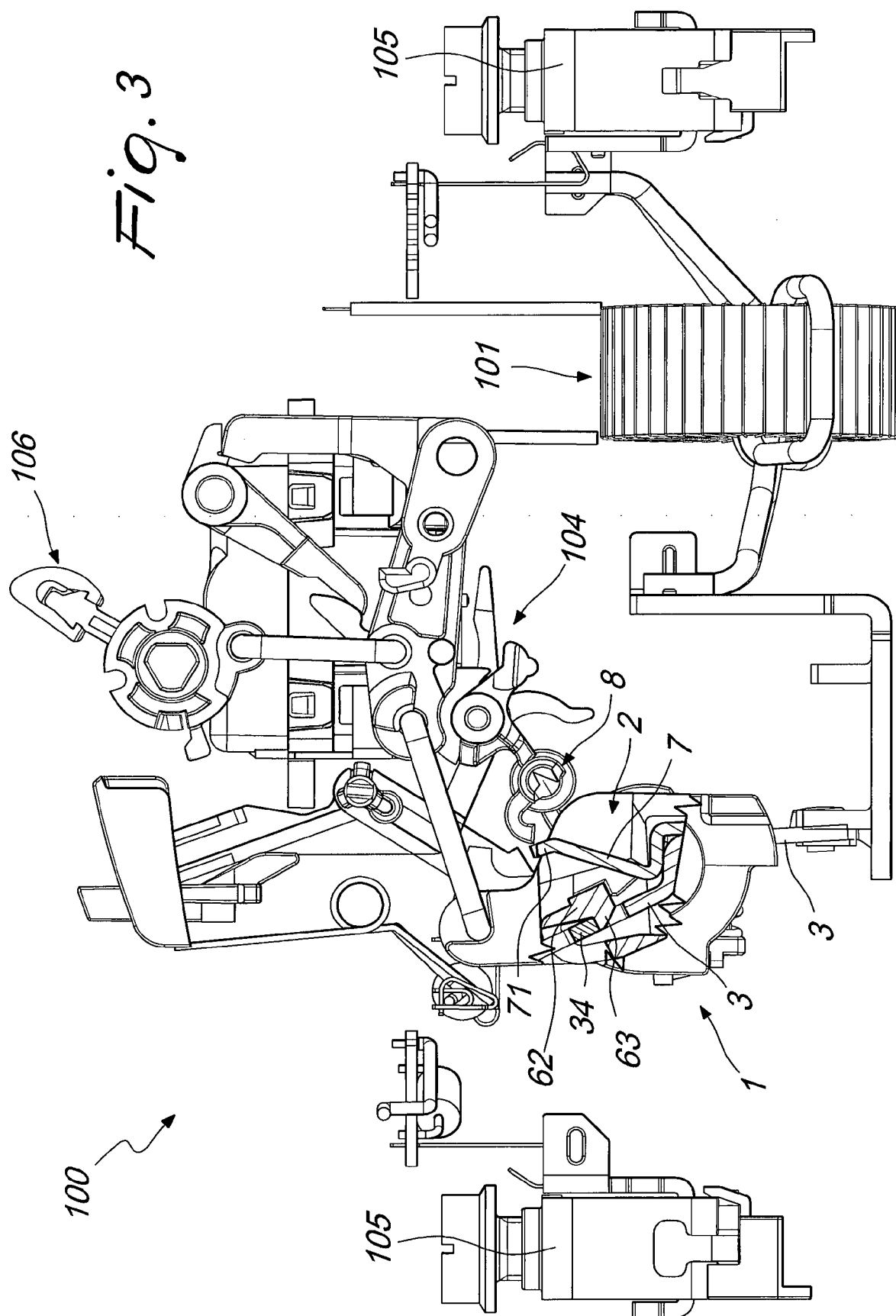


Fig. 3



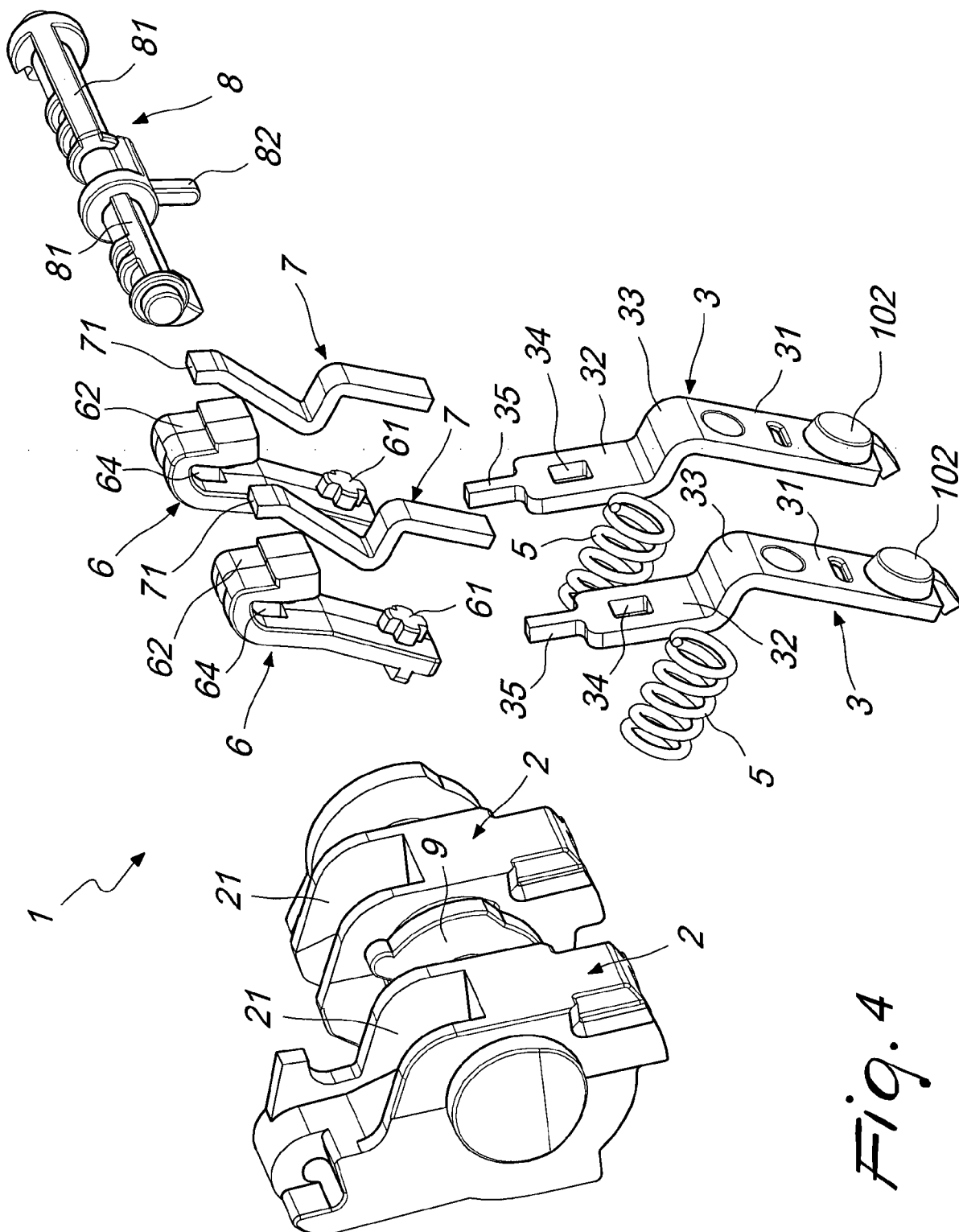
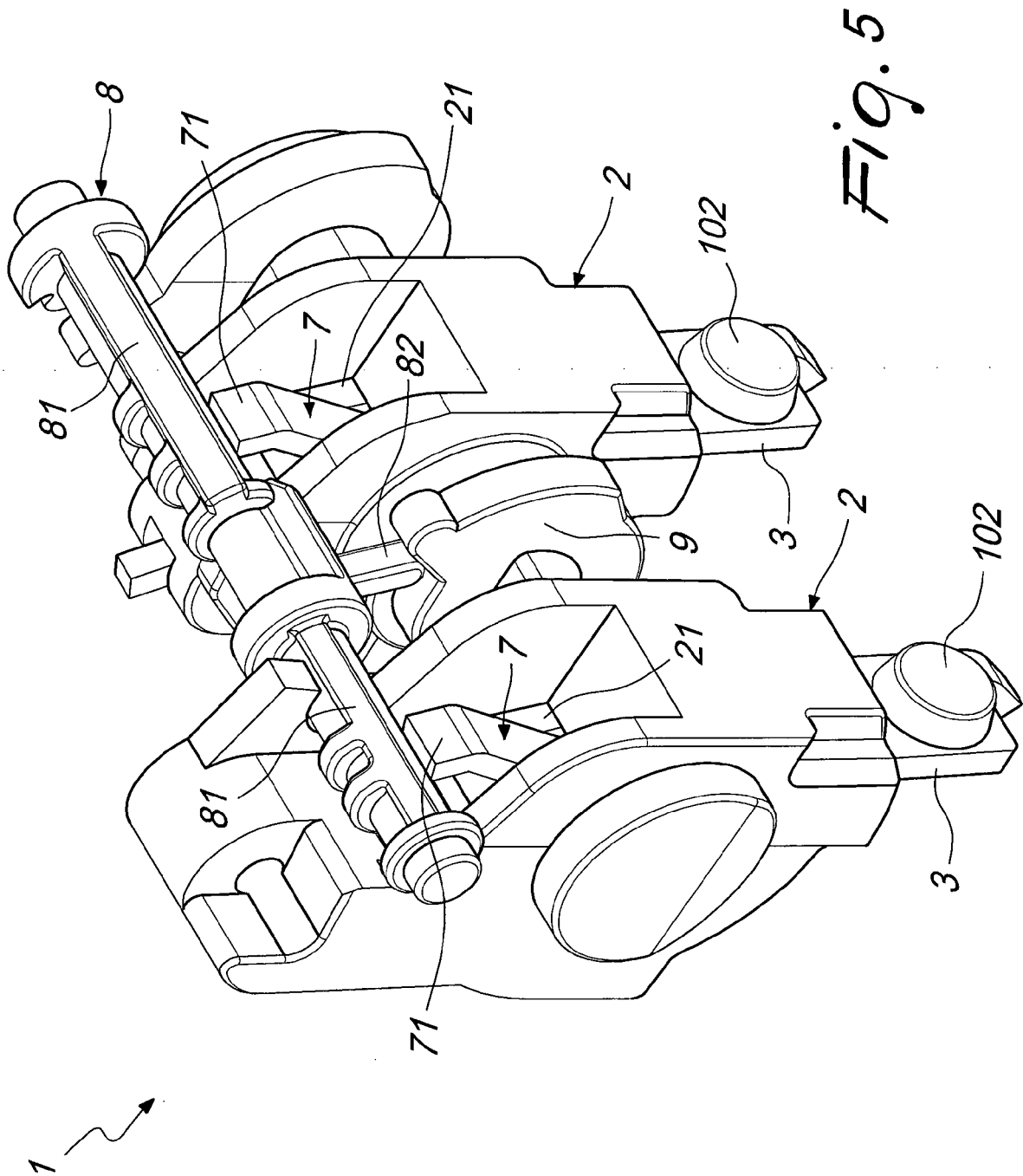


Fig. 4





EUROPEAN SEARCH REPORT

Application Number
EP 14 00 2118

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	FR 2 686 453 A1 (LEGRAND SA [FR]) 23 July 1993 (1993-07-23) * page 4, line 27 - page 23, line 35; figures 1-17 *	1-6	INV. H01H1/22
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 October 2014	Examiner Nieto, José Miguel
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 14 00 2118

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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22-10-2014

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