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(54) Title: BISTABLE MECHANISM FOR SWITCHING ELECTRICAL LOADS

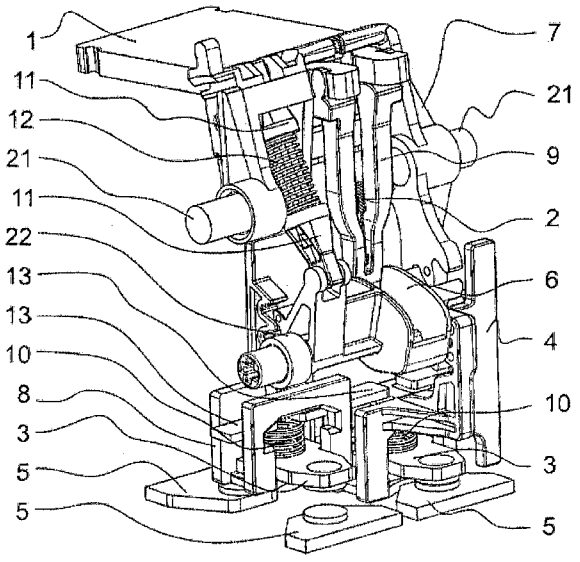


Fig. 1

(57) Abstract: A bistable mechanism is comprised of a spring (12) that is fastened to a lever (7) and a rocker arm (6) thus ensuring maximum torque. Bridges (4, 8) are fastened to the rocker arm (6) symmetrically to the axis of rotation of the rocker arm (6), and a contact spring (10) is compressed upon switch-off and switch-on, which makes it possible that the switch is switched over by way of various combinations of contacts with a minimum energy input that is provided by an electromagnet or a hand in the case of manual switching.

BISTABLE MECHANISM FOR SWITCHING ELECTRIC LOADS

The object of the invention is a bistable mechanism for switching electric loads in switching devices, wherein the mechanism and the form of contacts provide for the operation of the fundamental function which is switching of contacts by way of an electromagnetic drive that is excited by electric pulses and allows switching of contacts by minimum energy input. The invention belongs to class H01H 51/08 of the International Patent Classification.

The technical problem that is successfully solved by the present embodiment of a bistable mechanism is such a construction that reduces the energy needed for switching to the minimum, and it is further constructed in a simple and price efficient way.

Known solutions make use of various techniques and physical principles of operation of a mechanism of a switch. A mechanism of a switch provided with a cog wheel according to patent document EP 1024511 does not allow switching of large loads as the forces needed for switching would cause too much friction.

Another solution is a mechanism of a switch based on the principle of a heart-shaped anchorage according to document WO0186682 and EP1901327. A drawback of this solution is that the switching off is effected

at the second step, which means that the switch switches off only when the coil is without voltage or when the button is released in case the switch is switched manually.

A rocker arm mechanism provided according to patent EP 0641000 and EP 0641003 does not include switching of contacts by way of a contact bridge.

The bistable mechanism of the invention solves requirements for an energy-saving mechanism that simultaneously allows for coupling of contacts intended for large loads in a way that a spring of a rocker arm 12 is fastened to a lever 7 and to a rocker arm 6 and on the latter also bridges 4 and 8 are fastened symmetrically to the axis of rotation of the rocker arm 6.

The invention will be described by way of an embodiment and figures representing in:

Figure 1: bistable mechanism in switched-off mode with a closing and opening contact of the invention in axonometric projection;

Figure 2: schematic view of the bistable mechanism in switched-off mode with the closing and opening contact of the invention from front side;

Figure 3: schematic view of the bistable mechanism in switched-off mode with the closing and opening contact of the invention from a lateral side in cross-section;

Figure 4: bistable mechanism in switched-on mode with a closing and opening contact of the invention in axonometric projection;

Figure 5: schematic view of the bistable mechanism in switched-on mode with the closing and opening contact of the invention from front side;

Figure 6: schematic view of the bistable mechanism in switched-on mode with the closing and opening contact of the invention from a lateral side in cross-section;

Figure 7: bistable mechanism in switched-off mode with opening contacts of the invention in axonometric projection;

Figure 8: schematic view of the bistable mechanism in switched-off mode with two opening contacts of the invention from front side;

Figure 9: schematic view of the bistable mechanism in switched-off mode with two opening contacts of the invention from a lateral side in cross-section;

Figure 10: bistable mechanism in switched-on mode with two opening contacts of the invention in axonometric projection;

Figure 11: schematic view of the bistable mechanism in switched-on mode with two opening contacts of the invention from front side;

Figure 12: schematic view of the bistable mechanism in switched-on mode with two opening contacts of the invention from a lateral side in cross-section.

The bistable mechanism of the invention comprises a rocker arm 6 centrally arranged in a housing of a switch 22 and provided with a circular fastening, on which a guide of a spring 11 is fastened, another guide of the spring 11 is fastened into the circular fastening on a lever 7, and between said two guides of the spring 11 there is inserted a spring 12 ensuring force 14. The lever 7 is fastened on a plug of a housing 21. The lever 7 functions as signalisation of the mode of contacts and as a knob in the case the switch is switched manually. It is connected with the rocker arm 6 via cog wheel that ensures transmission of torque. The opening bridge 4 and the closing bridge 8 are connected to the rocker arm 6 symmetrically to the axis of rotation via cog wheels and a toothed rack. The bridges 4 and 8 are intended to move the contact bridges 3 and compress contact springs 10.

When the mechanism is provided with a closing contact at switch-on, the torque of the rocker arm 6 is created by force 14 and an arm a 16; this torque must exceed or be equal to the torque created by force 25 (force 20 reduced by a cosine of the angle α 18) that occurs due to the contact spring 10 being compressed when coming in contact with a housing 13 and an arm b 17.

When the mechanism is provided with a closing contact at switch-on, the torque of the rocker arm 6 is created by force 14 and the arm a 16; this torque must exceed or be equal to the torque created by force 19 (force 15 reduced by a cosine of the angle α 18) that occurs due to the contact spring 10 being compressed when the contact bridge 3 is moved closer due to a contact with a fixed contact 5 and the arm b 17.

When the mechanism is provided with an opening contact at switch-off, the torque of the rocker arm 6 is created by force 14 and the arm a 16; this torque must exceed or be equal to the torque created by force 23 (force 15 reduced by a cosine of the angle α 18) that occurs due to the contact spring 10 being compressed when the contact bridge 3 is moved closer due to a contact with the fixed contact 5 and the arm b 17.

When the mechanism is provided with an opening contact at switch-on, the torque of the rocker arm 6 is created by force 14 and the arm a 16; this torque must exceed or be equal to the torque created by force 24 (force 20 reduced by a cosine of the angle α 18) that occurs due to the contact spring 10 being compressed when coming in contact with a housing 13 and the arm b 17.

Any number of closing and opening contact sites can be assembled in any desired combinations. The condition is that the force 14 created by the spring 12 defines the torque it forms with the arm a 17 and the torque exceeds or is equal to the sum of torques created by the contact sites according to the rules described above.

The energy for switch-over is ensured by an electromagnet, of which an anchor 1 is a constituent part. The anchor 1 presses against a pushing element 9, and the latter transfers the force to the rocker arm 6 which converts the linear movement of the pushing element 9 to the torque which moves the bridges 4 and 8 via cog wheels.

The bistable mechanism of the invention can also be switched manually. In this case the lever 7 is acted upon and it oscillates around the fastening in the housing 13 and drives the rocker arm 6 via a cog wheel pair, and the rocker arm 6 then moves the bridges 4 and 5 by way of cog wheels and the toothed rack.

CLAIMS

1. A bistable mechanism that uses a rocker arm (6) to perform its function

characterized in that

fastening of a spring (12) is made by way of guides of a spring (11) between a lever (7) and the rocker arm (6) in a way that it ensures maximum torque of the rocker arm in the switching mode.

2. The bistable mechanism according to claim 1

characterized in that

regardless of the number and type of contact sites either in the switched-on or switched-off mode there is the same torque that acts on the rocker arm (6), and this is made possible by a limit stop of the housing (13) which ensures the contact spring (10) to compress even when the contact is switched off.

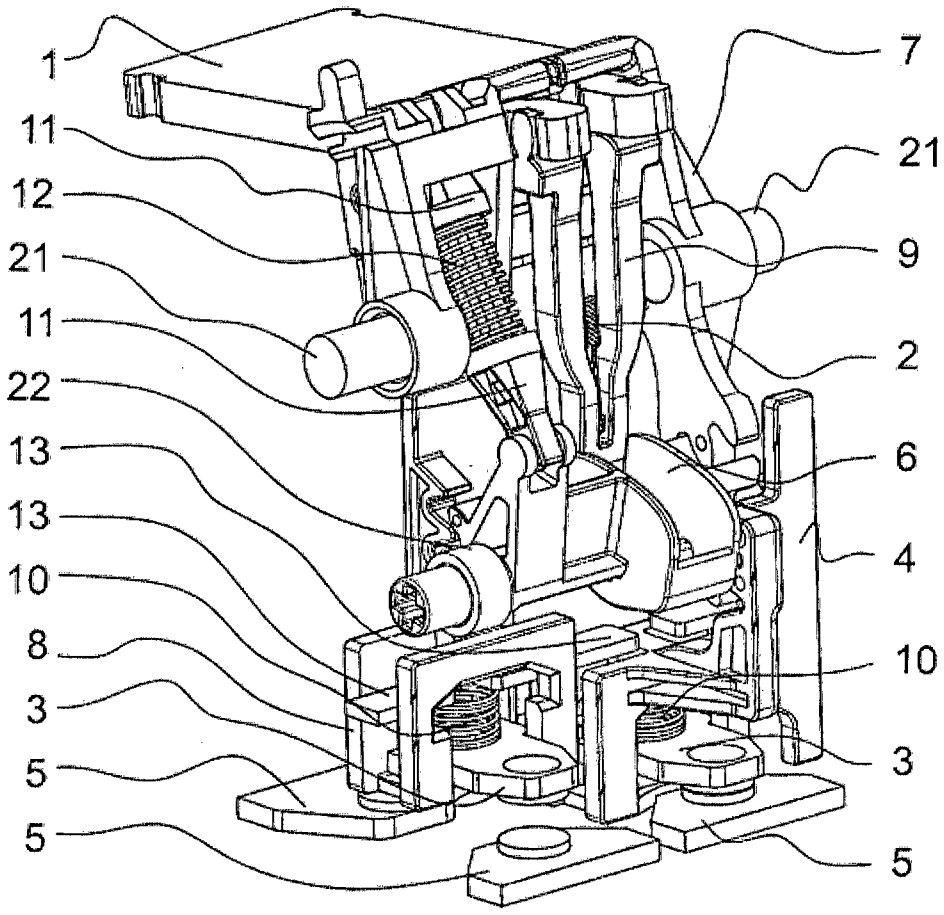


Fig. 1

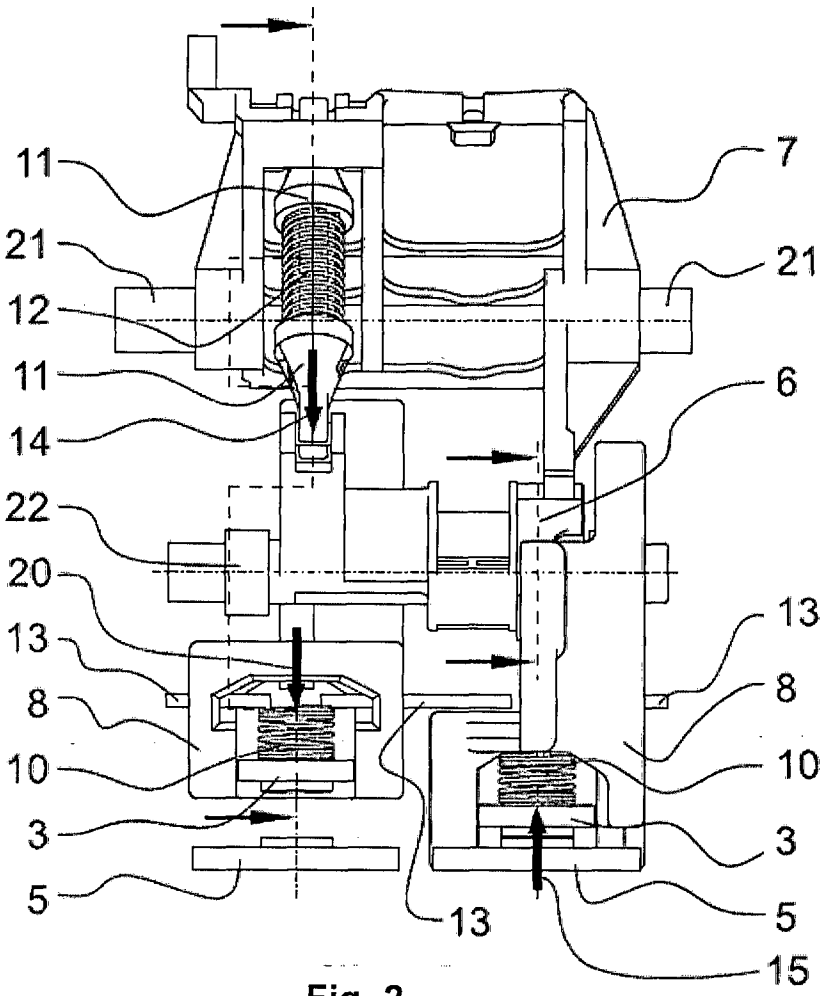


Fig. 2

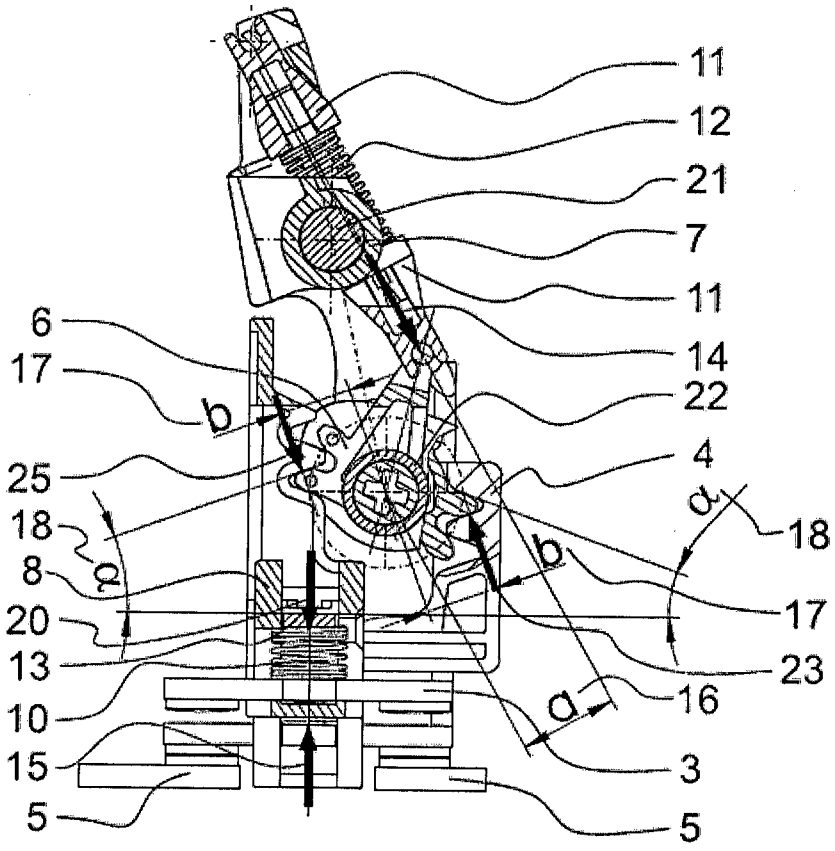


Fig. 3

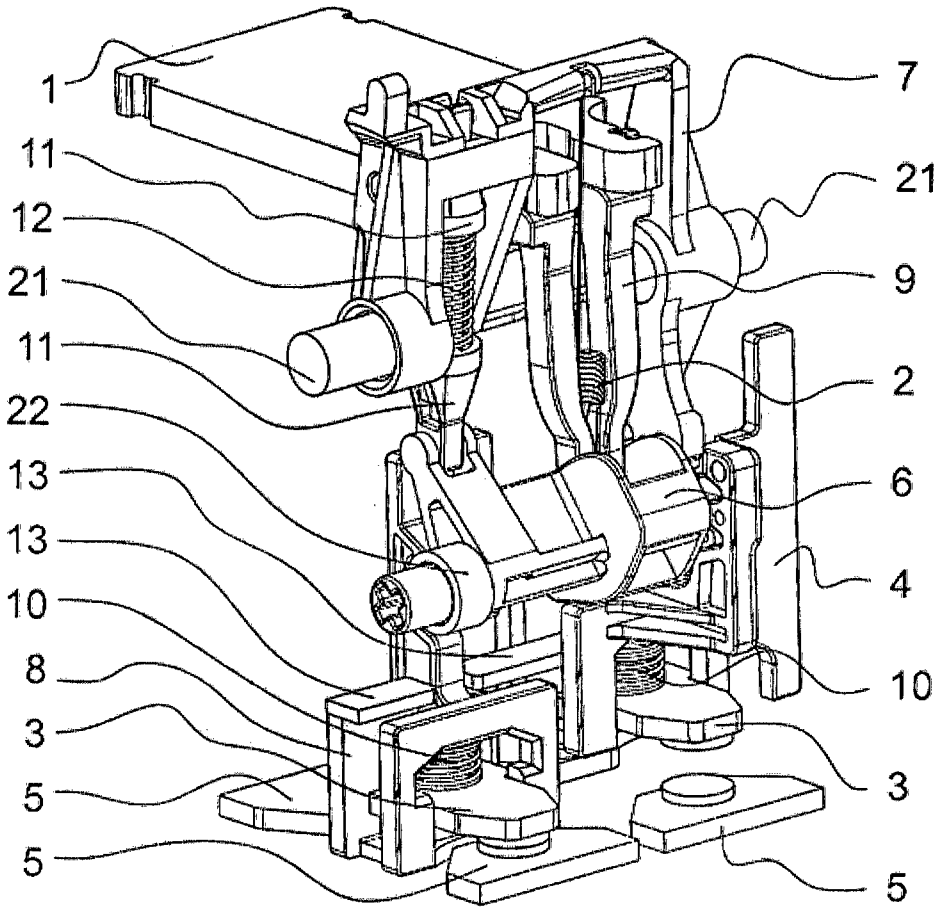


Fig. 4

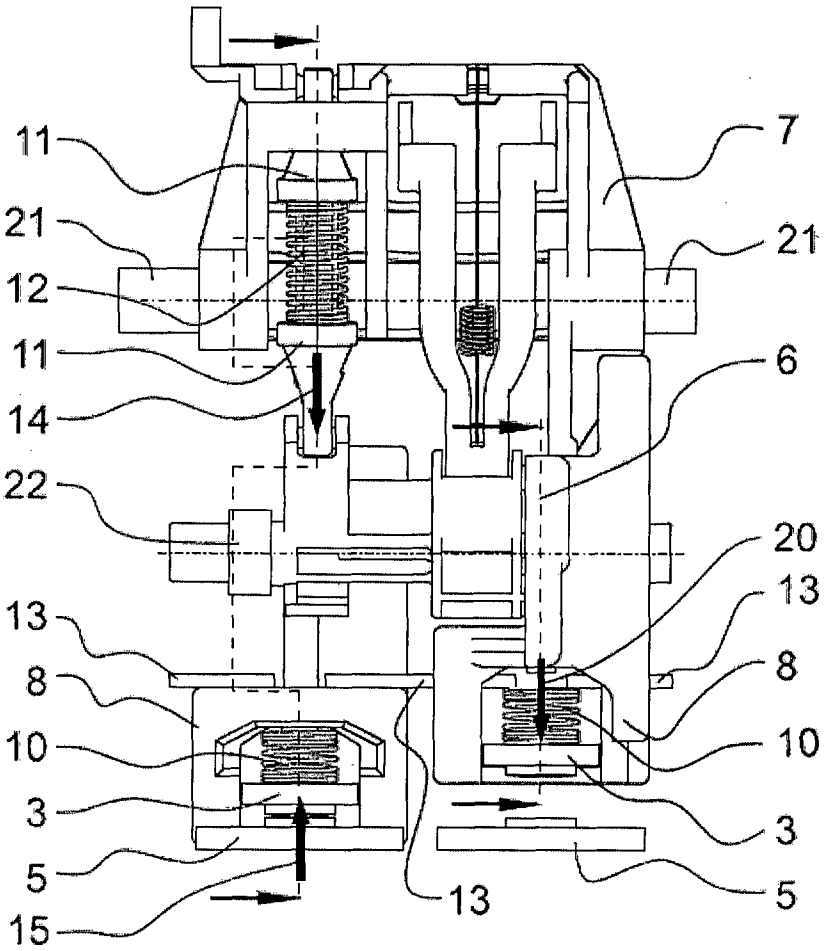


Fig. 5

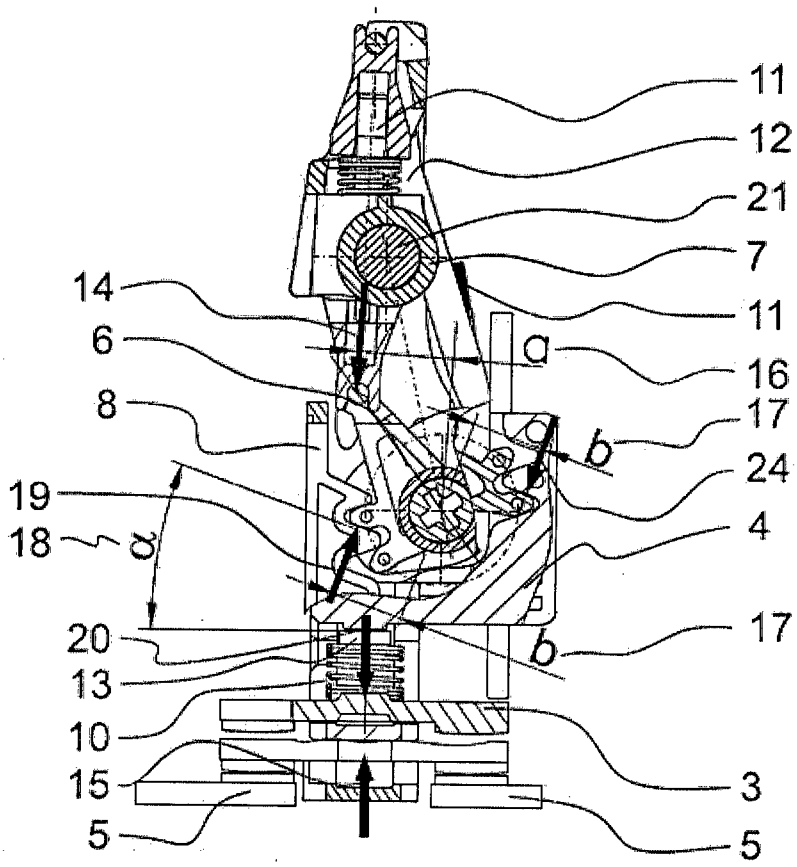


Fig. 6

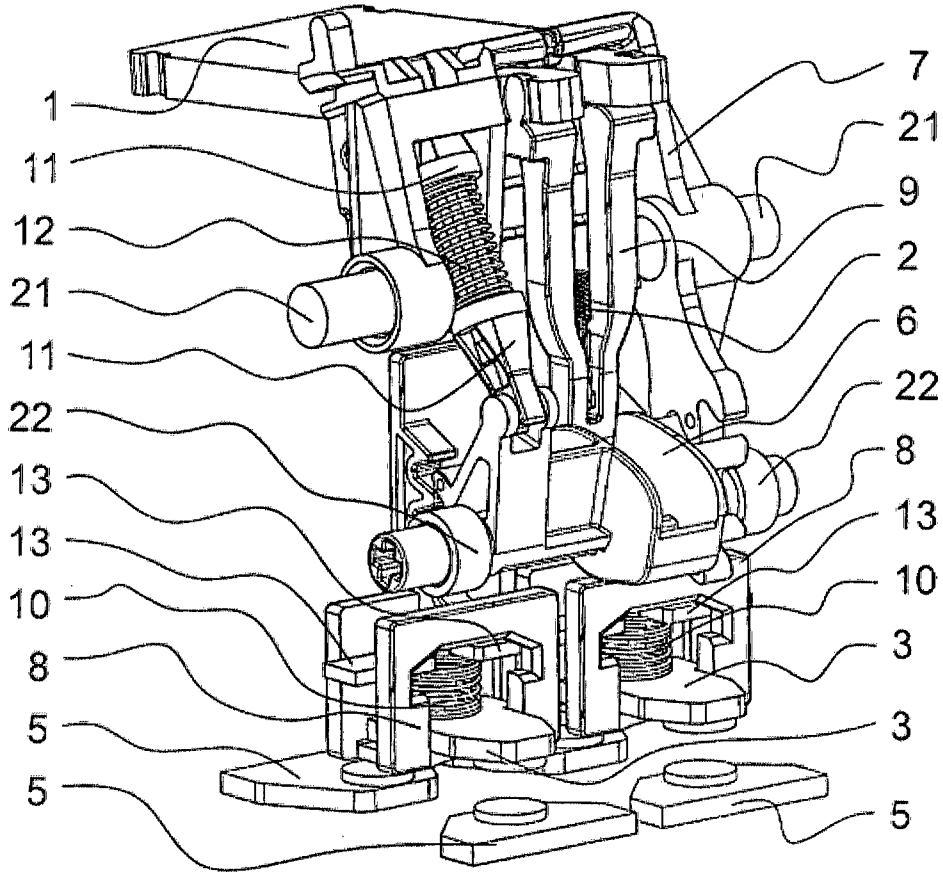


Fig. 7

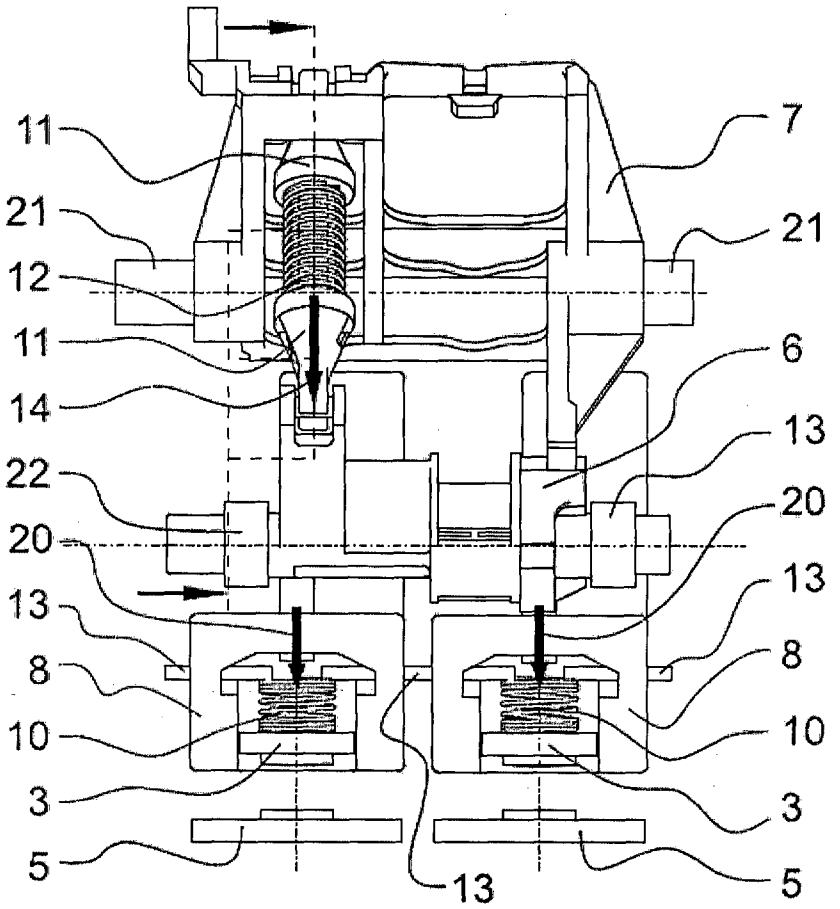


Fig. 8

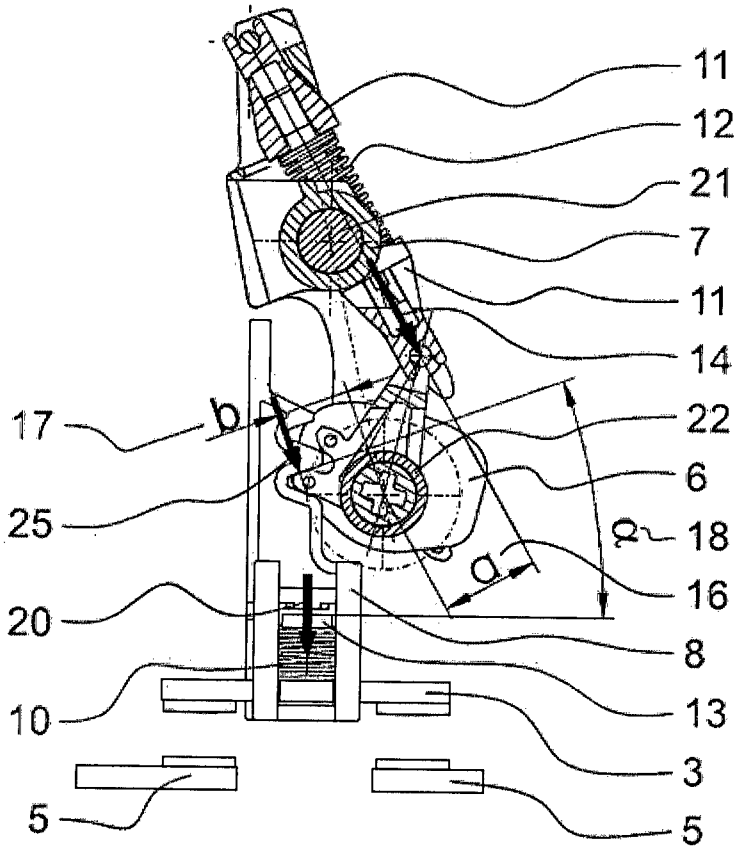


Fig. 9

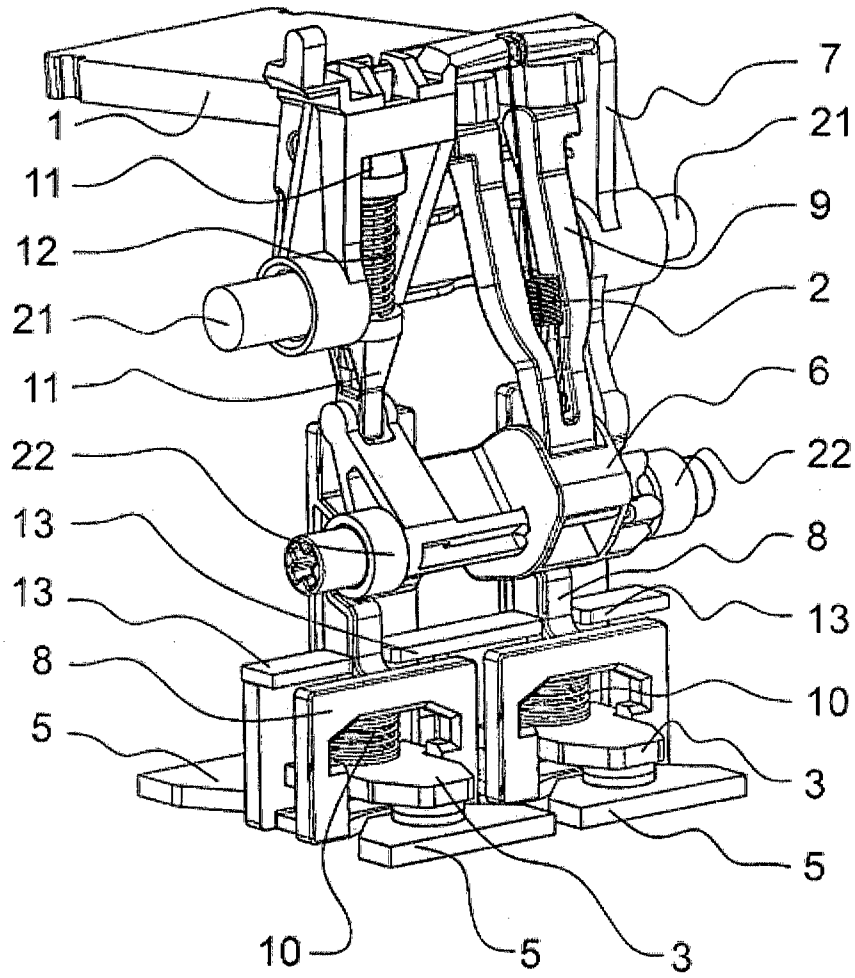


Fig. 10

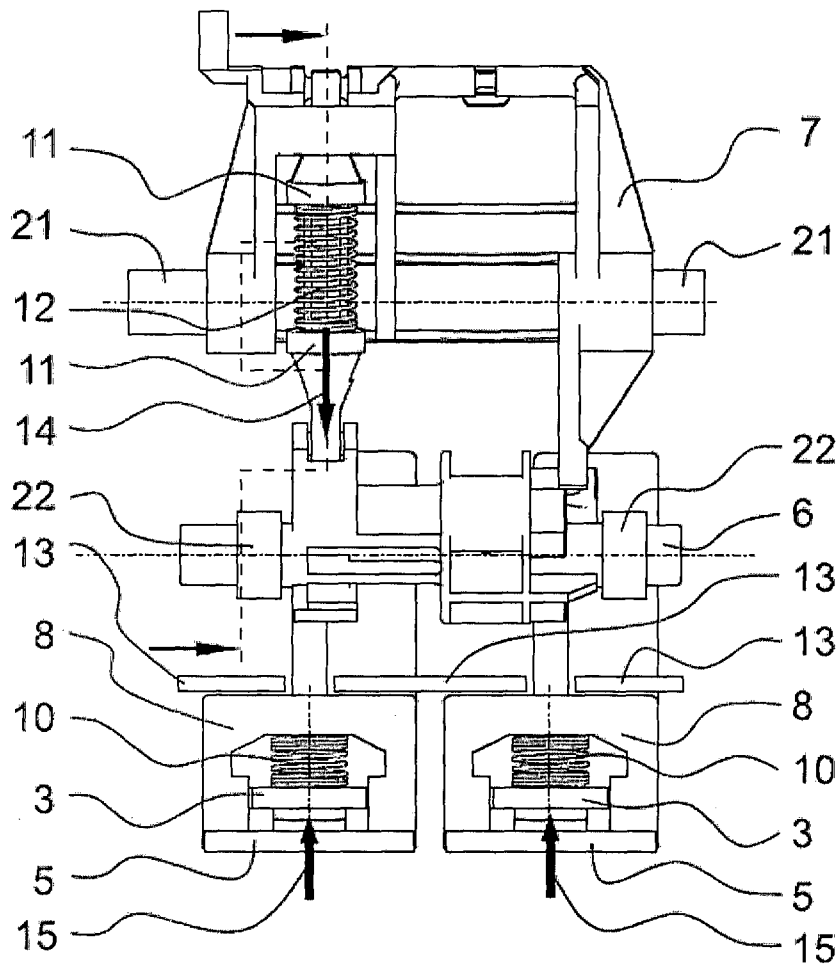


Fig. 11

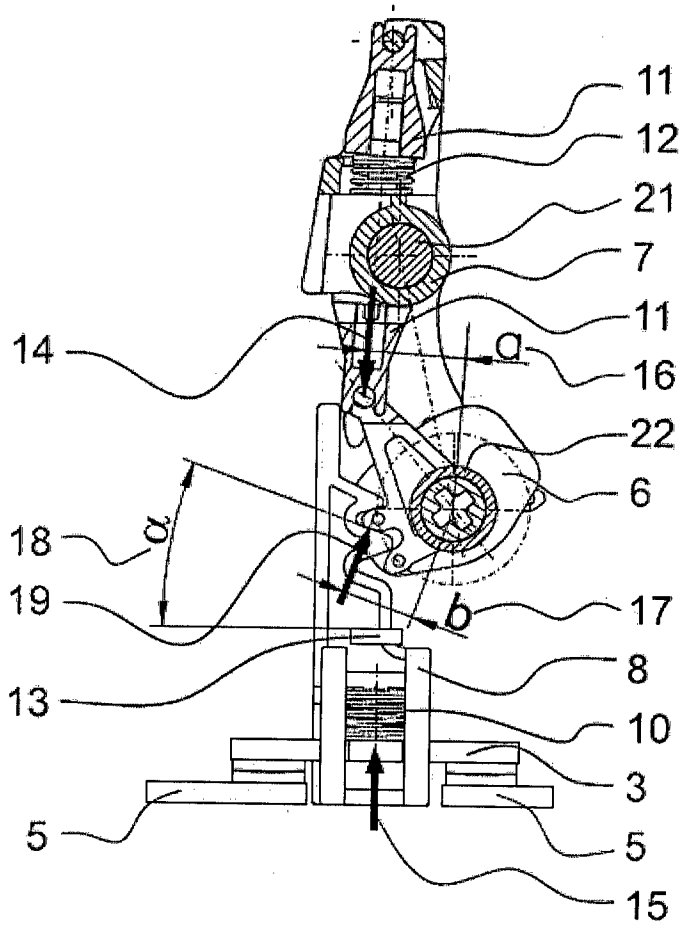


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No
PCT/SI2013/000036

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01H5/06 H01H51/08
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 827 172 A1 (SCHNEIDER ELECTRIC SA [FR] SCHNEIDER ELECTRIC IND SA [FR]) 4 March 1998 (1998-03-04) column 2, line 33 - column 5, line 15; figures 2-10	1,2
X	EP 0 271 366 A1 (MANG ETS GERARD) 15 June 1988 (1988-06-15)	1
Y	column 4, line 5 - column 5, line 15; figures 3-7	2
Y	US 2 830 149 A (WINANS JOSEPH D) 8 April 1958 (1958-04-08) column 1, line 50 - column 2, line 39; figures 1-3	1,2
	-/--	

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
28 January 2014	05/02/2014

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/SI2013/000036

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2012/154131 A1 (ISKRA MIS D D [SI]; RODE MARKO [SI]) 15 November 2012 (2012-11-15) page 3, line 8 - page 4, line 12; figures 1-6 -----	1,2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/SI2013/000036

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