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(54) Self-locked and self-retained safety electrolock

(57) Safety lock for closing movable shutters between an opening position and a closing position, comprising a housing (56) applicable to said shutter by means of a front (23), a latch (2) sliding within said housing between a retracted position of shutter-opening and a withdrawn position of shutter-closing, a first pivot (6) sliding between a position of interference and a position of non-interference with said latch (2), said pivot having a protuberance close to the central region, a catch (3) movable between a withdrawn position of door-opening and retracted position of door-closing, the catch (3) having a striker surface (9) which is counter-shaped relative to said protuberance (4) to operate the displacement of said pivot (6) between said position of interference and said position of non-interference with said latch (2).

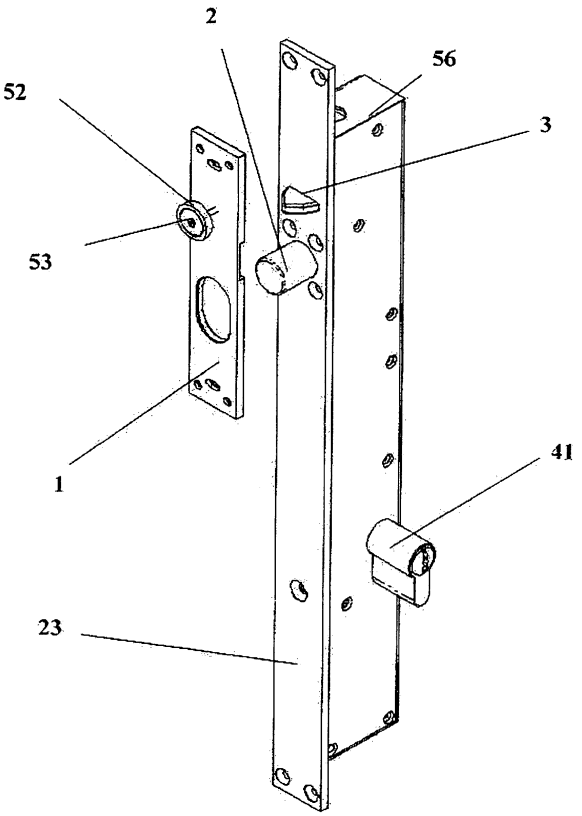

Fig. 6

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Description

[0001] The object of the present invention is a self-locked and self-retained safety electrolock.

[0002] The locks are usually utilized for the opening/closing of shutters.

[0003] There are known three configurations of lock systems which are electromagnetically driven, "normally open", "normally closed" and "double-acting".

[0004] By the term "normally open" it is meant that, under power failure conditions, the latch of the lock withdraws to its housing and closes automatically the door.

[0005] By the term "normally closed" it is meant that, in case of power failure, the lock takes up automatically the door's closing/blocking position.

[0006] By the term "double-acting" it is meant that the lock, once having taken up the closing or opening position by an electric command, it remains in this state until the command is given again, so that, the electric command is to be kept only for the time between the shift from one condition to the other (from closed to open, and vice versa), usually a fraction of a second, thereby reducing the resulting consumptions.

[0007] In case the above effects occur when the shutter/door is not made to abut against its casing, and the electrolock is of normally closed type, a failure of power causes the exit of the latch, which prevents the door from closing afterwards; in case of normally open version, such drawback does not occur for power failure, but it would occur if the power were supplied because of a defect in the control circuit.

[0008] The object of the present invention is to overcome the above cited drawbacks by providing an automatic lock which makes it possible to always have the piston in open position when the shutter/door is not into abutment with its casing, thereby allowing the shutter to return into abutment therewith without obstacles and the electrolock to take up its closed or open condition.

[0009] A further object of the present invention is to give the electrolock the possibility of preventing (via an electric command) the opening thereof by the relevant cylinder, despite the respective key being available.

[0010] This application, for example, may be extremely useful for access control systems, to prevent using the mechanical key when these controls operate correctly and, instead, to habilitate the use thereof when the same controls result out of order or without power supply.

[0011] These and further objects that will appear more clearly by the detailed description that follows, are achieved, according to the present invention, by an electrolock having the structural and functional characteristics according to the attached independent claims. Moreover, further embodiments of the invention are specified in the corresponding dependent claims.

[0012] The invention is illustrated in greater detail with reference to the accompanying drawings which depict one exemplary and not limiting embodiment thereof. In the drawings:

- Fig. 1 shows a lock according to the present invention in the closing state;
- Fig. 2 shows a lock according to the present invention in the first opening step;
- Fig. 3 shows a lock according to the present invention in the second opening step;
- Fig. 4 shows a lock according to the present invention in which the opening step is performed by mechanical means;
- Fig. 5 shows a state of impediment to the opening of the lock shown in the preceding figures; and
- Fig. 6 is an exploded view of the lock of the preceding figures.

[0013] With reference to Fig. 1, the lock comprises a housing 56 which develops longitudinally to the axis A, a latch 2 sliding between an opening position and a closing position, perpendicularly to the axis A, a first pivot 6 sliding between a position of interference and one of non-interference with the latch 2, parallel to the axis A. The pivot 6 exhibits a protuberance, close to the central region, upon which a release dent 4 is formed.

[0014] The lock also comprises a catch 3 movable parallel to the axis A and having an inclined step 9, in proximity of the central region, counter-shaped with respect to the dent 4; the catch 3 makes up the logic element between the mutual movement of latch 2 and pivot 6.

[0015] Advantageously, the lock may also comprise a first electromagnetic coil 20 having inside a core 19 movable parallel to the axis A, driving means being connected to the upper end of core 19 and counter-shaped with respect to the slot 13 formed directly on the lower surface of the latch 2 to move the latter from the closing position to the opening position.

[0016] In Fig. 1 the lock according to the invention is shown in closed state, when the fixed shutter and the movable shutter of the door on which the lock is mounted are lined up, a selvage 1 keeps pressed the catch 3, which is guided on a block 5, by means of a spring 7.

[0017] The catch 3 has an inclined step 9 which acts upon the release dent 4, the latter being in turn guided onto the block 5 with a guide 10 parallel to the axis A and by means of a pivot 6 fixed thereto and provided with a load spring 8.

[0018] The release dent 4 is also guided onto a block 24 by a pivot 11 inserted into a channel 14.

[0019] The pivot 11 is lifted to a preset level which allows the latch 2, when moving back along a channel 55 of the block 24, not to interfere with the same pivot 6.

[0020] In Figs. 2 and 3, the lock according to the present invention is shown in the two subsequent opening stages to be described below in greater details.

[0021] When the coil 20 is powered, the induced magnetic field push the core 19, which is hinged at 17 to a bracket 16, downwards.

[0022] The bracket 16 is in turn hinged at 21 to a link 15 connected via a hinge 22 onto the block 24.

[0023] The link 15 is made to engage tangentially with-

in a slot 13 of the latch 2.

[0024] The kinematics thus created makes it possible, with the downward sliding of core 19 parallel to axis A, to withdraw the latch 2 along the channel 55 of block 24 until it is flush with a front plate 23 perpendicularly to axis A.

[0025] The consequence of this translation of latch 2, is the alignment of a slot 12 of latch 2 with a pin 11 of the release dent 4.

[0026] Upon opening the door provided with the lock, when the selvage 1 and the front plate 23 do not result lined up, the catch 3, owing to the compression of spring 7, comes to the end of stroke onto the plate 23 and allows the release dent 4, also compressed by the spring 8, to move downwards parallel to the axis A, so as to insert the pivot 11 into the slot 12 of latch 2.

[0027] In case the supply of coil 20 is cut off, the natural tendency of the system would be that of returning to the state of closed latch, but, owing to the compressed spring 17 which acts upon the no-longer energized core 19, and the interaction of pivot 11 with the slot 12 of latch 2, this does not occur.

[0028] The same thing occurs if the system is still energized. The only way for the system to return to the closing state, when no power is supplied, is to restore the condition of Fig. 1, with the selvage 1 that keeps the catch 9 pressed.

[0029] A further aspect lies in the fact that the opening of a door provided with the lock of the present invention can take place by the actuation of a safety cylinder 41, that is, in mechanical and not electrical mode.

[0030] Fig. 4 shows the opening state obtained by means of a cylinder 41 to be described below.

[0031] The cylinder 41 compresses a bit 42 which, by rotating, acts onto a slide 34 guided on the front plate 23 by a first screw 31 and, onto the block 36 by the action of a second screw 32 which receives a return spring 33. In this way, the slide 34 is able to translate parallel to the axis A and to act on the link 15 via a tooth 29, thereby re-creating, mechanically, the kinematics obtained by the electrical actuation as above described.

[0032] Upon completion of the action by the bit 42, the slide 34 returns to the initial position owing to the compression of spring 33.

[0033] With reference to any of the attached figures 1 to 5, the lock, in order to reach the second object previously indicated, that is, to prevent the opening of a door by means of a key, may also provide the possibility of applying a voltage to a second coil 44 which, with the generated magnetic field, pushes a second core 46 and a small shaft 45 connected thereto on top.

[0034] The effect of such action is the thrust that the small shaft 45 applies onto the disc 38.

[0035] Fixed to the disc 38 is a pivot 35 able to slide, parallel to the axis A, into a block 36 suitably drilled.

[0036] The head of pivot 35 brushes against the slide 34, thereby actually preventing the bit 42 of cylinder 41 from acting on the slide 34 and thus opening the door. In the absence of power supply, the pivot 35 moves again downwards, parallel to axis A, by the action of the compression spring 43 being loaded while feeding the coil 44.

[0037] The second core 46 too translates downwards again, parallel to axis A, by the action of a return spring 48.

[0038] In order to ensure the correct operation of the kinematic links above described, the lock comprises at least four control regions.

[0039] The first control is carried out by a microswitch 25 whose tab 26, in the closing state of latch 2, is compressed by the action of a flap 27 of bracket 16; said microswitch 25 allows detecting the closing state of the lock.

[0040] A further control is carried out by a second microswitch 40 whose tab 39 is actuated by the pivot 28 when the first core 20 is powered upon the opening stage; this second control allows knowing if the lock is open at the end of stroke of latch 2.

[0041] The third control is carried out by a further microswitch 50 whose tab 30 is held inside the slot 51 of slide 34, and allows checking if the lock has been open mechanically by the safety cylinder 41.

[0042] The fourth and last control makes it possible to know the state of alignment of the fixed shutter with the movable shutter of the door.

[0043] When the selvage 1 and front plate 23 are lined up, a magnet 52, fixed to the selvage 1 via a screw 53, energizes a reed sensor 54 connected to the front plate 23, and allows checking the state of opening/closing of the door.

[0044] The invention allows achieving important advantages.

[0045] First of all, a lock according to the present invention allows the user to be certain that, in case of power failure, the door provided with the above described lock is able to return into abutment with the casing with no impediment by the piston, so that the user does not have to do any additional action for closing or opening the door.

[0046] Secondly, a lock according to the present invention allows the user to decide, via a remote control, whether to allowing the opening/closing of the door by the use of a key, or disabling this function.

[0047] The invention has been described with reference to a preferred embodiment thereof. However, it is intended that equivalent modifications could possibly be made without departing from the scope of protection granted to the present industrial invention.

Claims

1. Safety lock for closing movable shutters between an opening position and a closing position, comprising:

   a housing (56) applicable to said shutter by means of a front (23),

   a latch (2) sliding within said housing (56) between a retracted position of shutter-opening

and a withdrawn position of shutter-closing,
a first pivot (6) sliding between a position of interference and a position of non-interference with said latch (2), said pivot having a protuberance close to the central region,
a catch (3) movable between a withdrawn position of door-opening and retracted position of door-closing, the catch (3) having a striker surface (9) which is counter-shaped relative to said protuberance (4) to operate the displacement of said pivot (6) between said position of interference and said position of non-interference with said latch (2).

2. Lock according to claim 1, wherein the catch (3) is countershaped relative to a release dent (4) formed on said protuberance.

3. Lock according to claim 1 or 2, further comprising:

a first electromagnetic coil (20),
a first core (19) disposed inside said coil (20) and movable parallel to said axis A,
driving means connected to the upper end of said core (19) and countershaped with respect to a slot (13) formed directly on the lower surface of said latch (2), to move said latch (2) from said closing position to said opening position.

4. Lock according to claim 3, further comprising an operating control to energize said first coil (20).

5. Lock according to any of the preceding claims, wherein said latch (2) shifts from said opening position to said closing position by means of mechanically operated controls.

6. Lock according to claim 4 or 5, wherein said safety cylinder (41) comprises a rotating bit (42).

7. Lock according to any of the preceding claims, further comprising at least four control regions.

8. Lock according to claim 7, wherein said control regions comprises electrical microswitches.

9. Lock according to claim 7, wherein said control regions comprises magnetic sensors.

10. Lock according to any of the preceding claims, further comprising:

a second electromagnetic coil (44),
a second core (46) disposed inside said second coil (44),
driving means connected to the upper end of said second core (46) and movable between a position of non-interference and a position of interference with said bit (42) of said safety cylinder (41) to prevent the rotation of said bit (42).

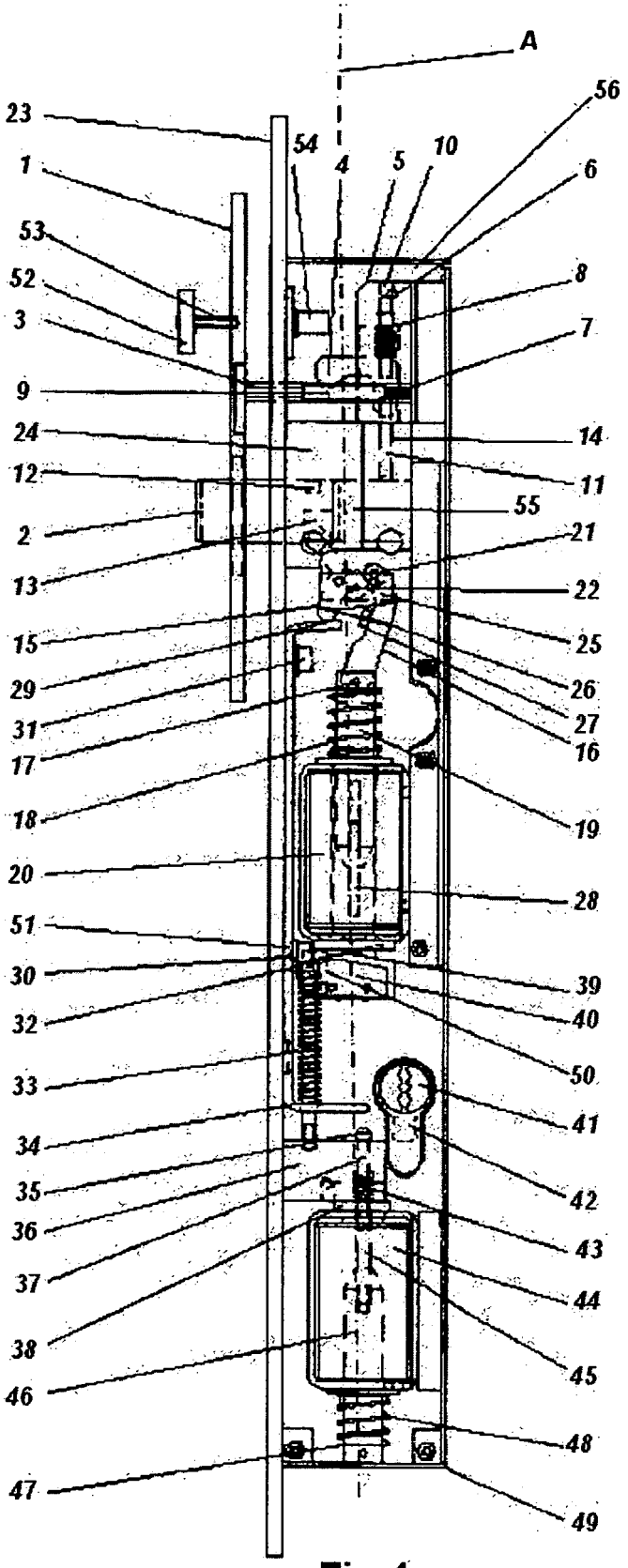
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Fig.1

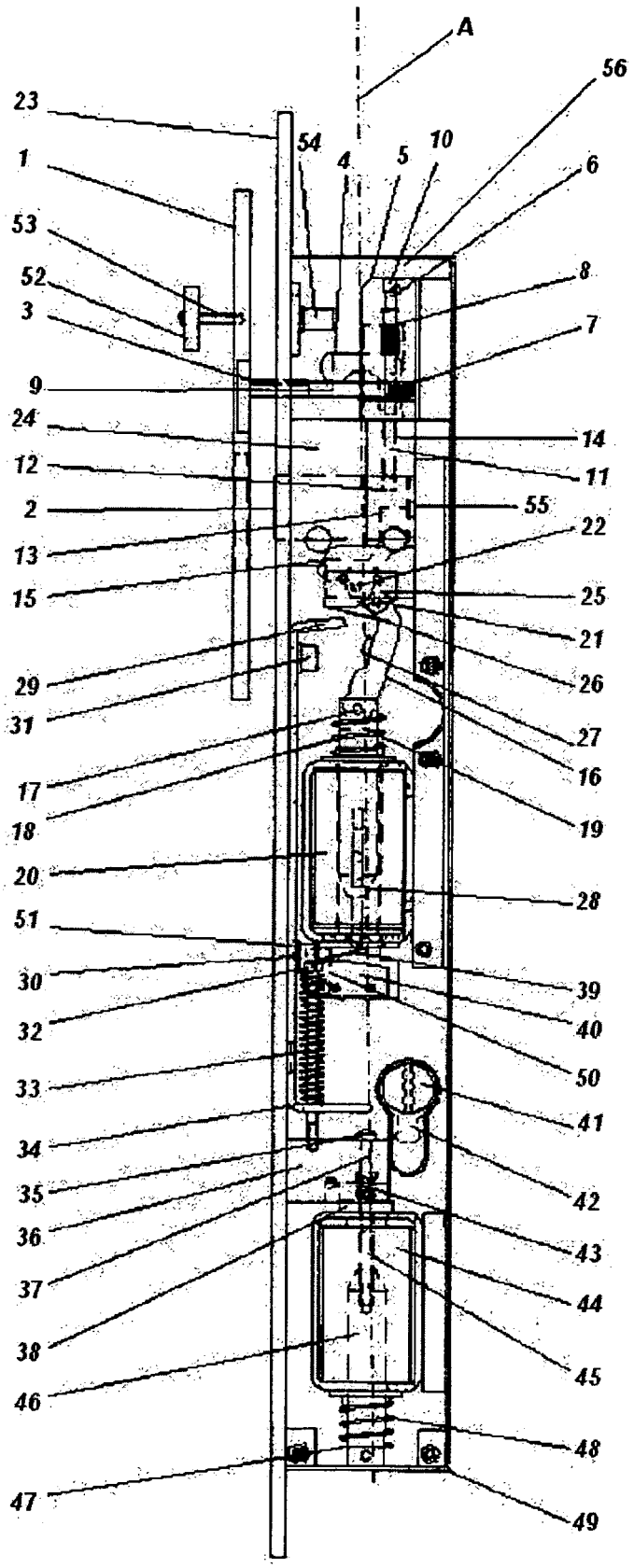
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Fig.2

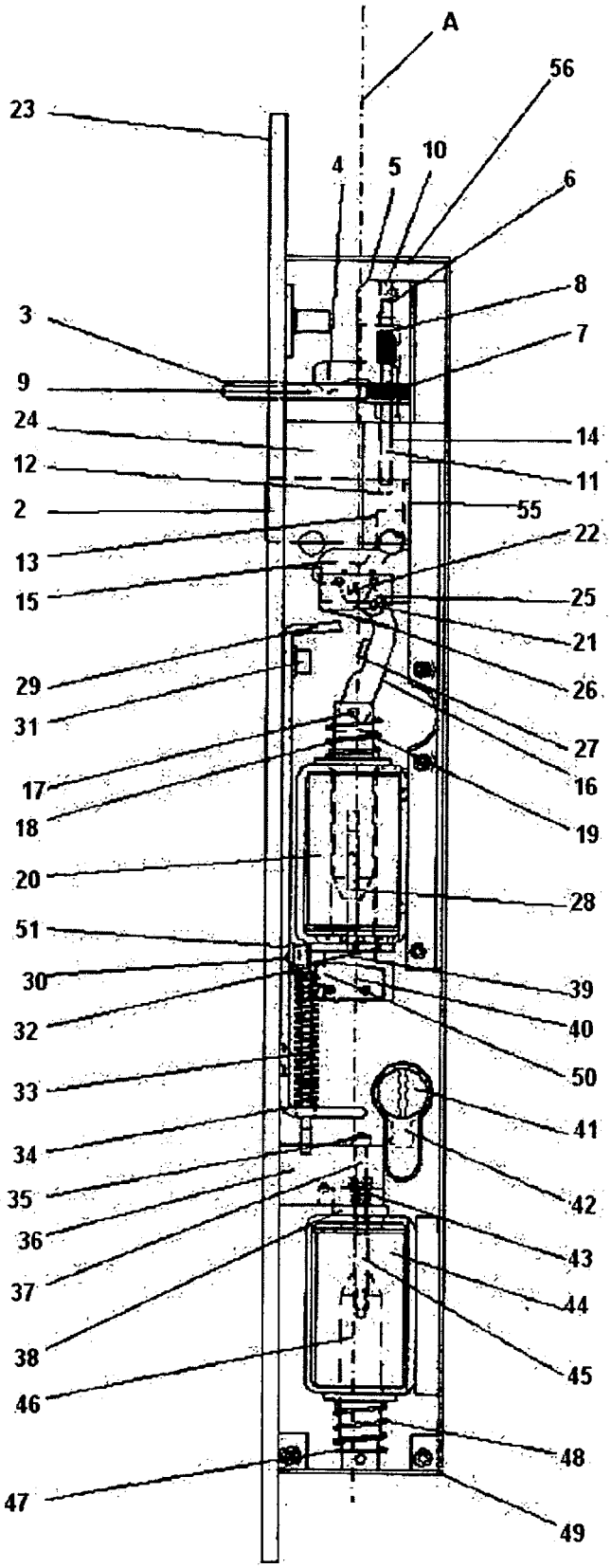
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Fig.3

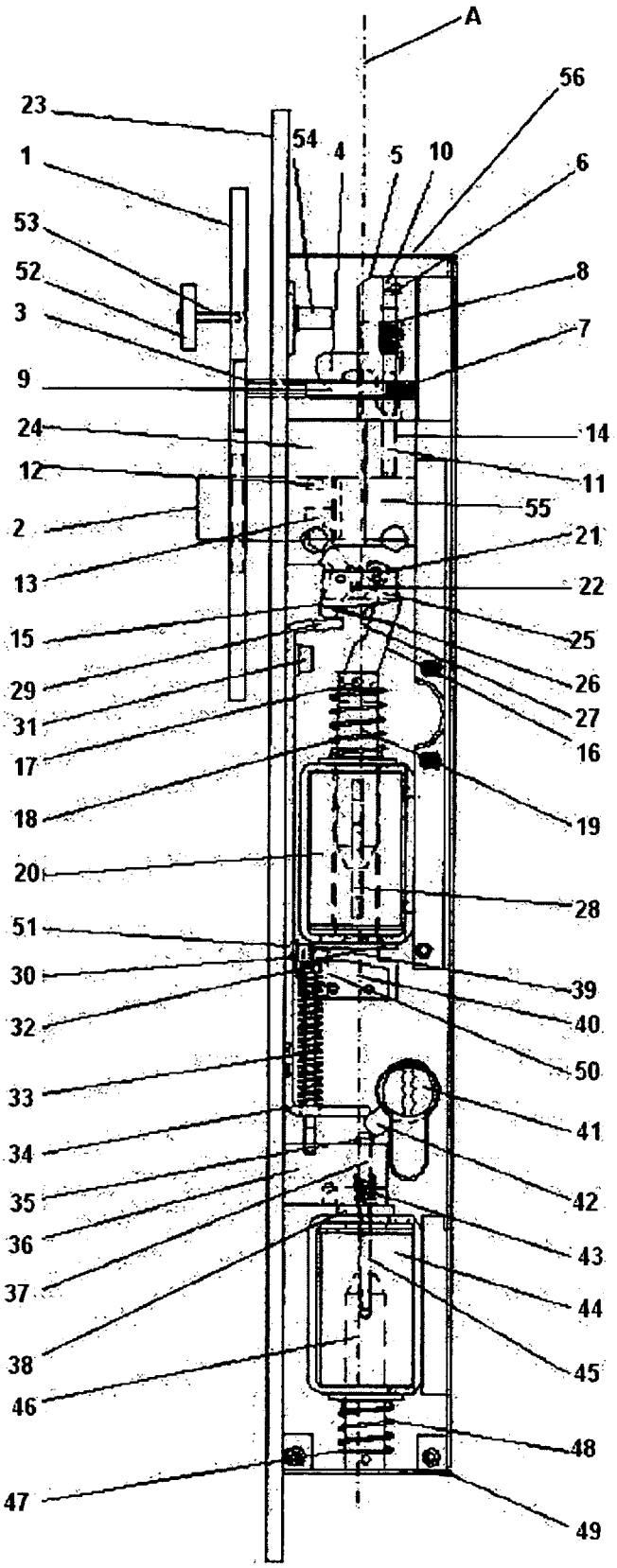
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Fig.4

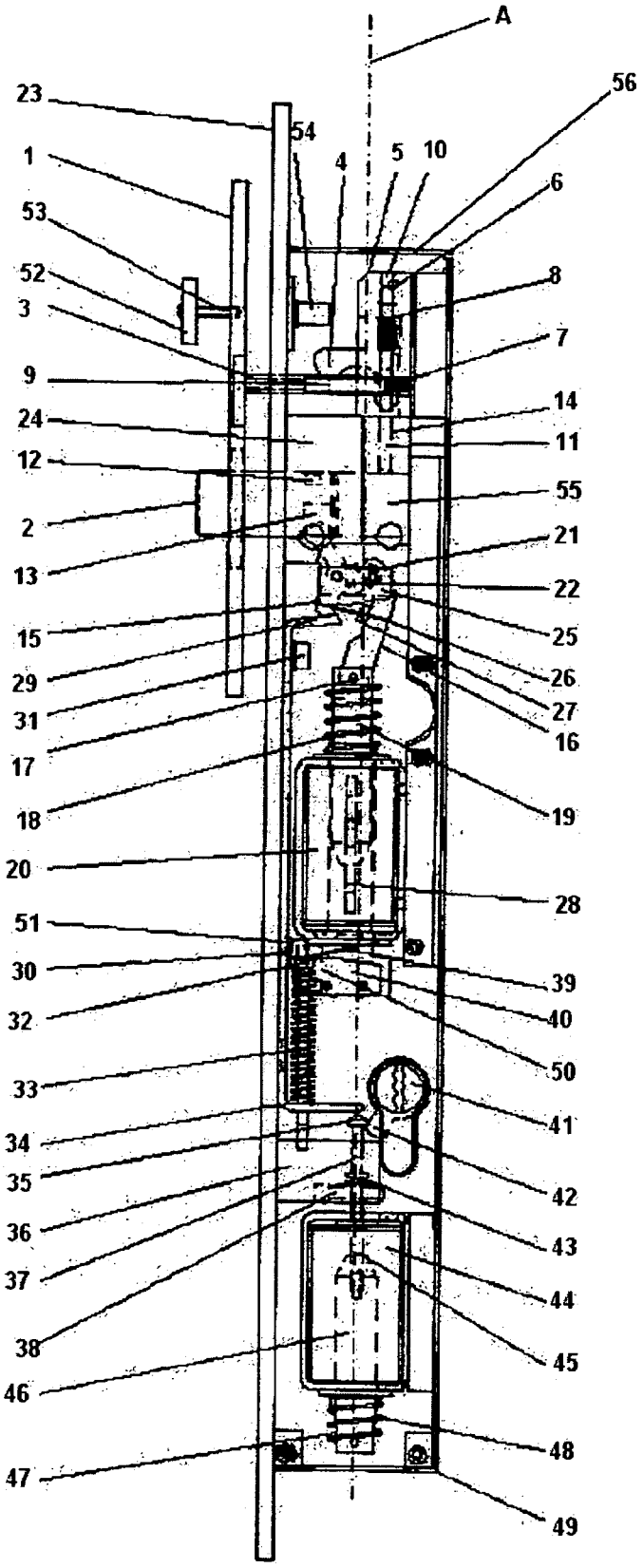
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Fig.5

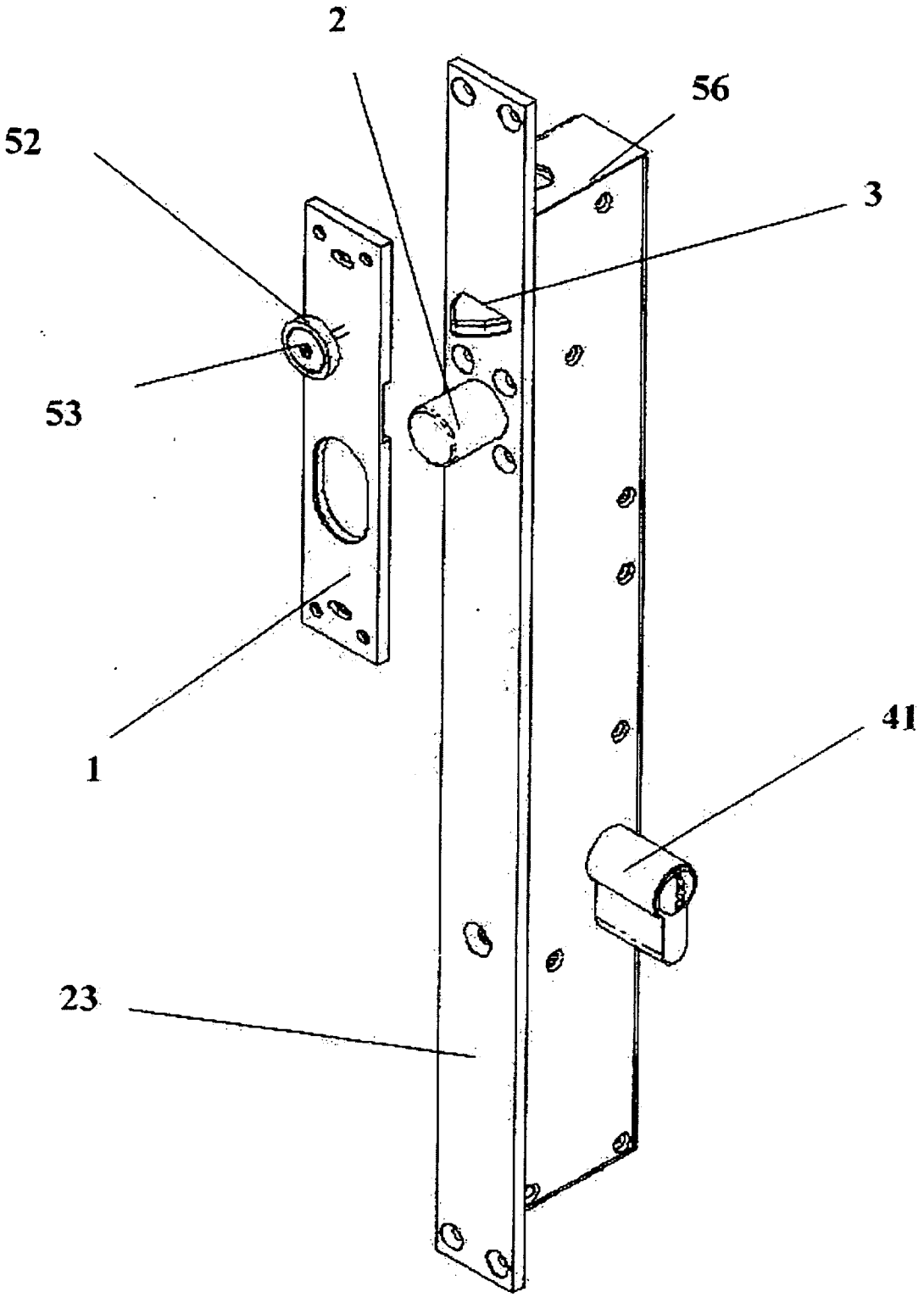

Fig. 6