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(54) Benævnelse: **LÅSEANORDNING OMFATTENDE EN DEAKTIVERINGSMEKANISME**

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WO-A1-87/04213
FR-A1- 2 653 480
FR-A1- 2 879 643

DESCRIPTION

FIELD OF THE INVENTION

[0001] The present invention concerns an electrically driven fail-safe locking device comprising with a tubular housing.

BACKGROUND OF THE INVENTION

[0002] With an increasing interest for access control plans and series of locking devices comprised therein, there is a market demand for easy to install locking devices that are operable both mechanically and electronically, without jeopardizing safety, both in terms of theft-prevention and automatically unlocking (fail-safe) in case of fire or other in-house threads.

[0003] FR 2,653,480 discloses a fail-safe locking device for emergency exits, the locking device comprising an electromagnet to maintain a latch in a closed position. When power supply to the electromagnet is interrupted, the latch is retracted in to the housing of the locking device by means of a spring. An electro-motor is provided for moving the latch to a closed position of the locking device after power supply is recovered.

[0004] A drawback of the locking device according to FR 2,653,480 is that it does not allow controlled opening and closing of the locking device without interrupting the current first and consecutively recovering power supply to the electromagnet and electro-motor.

[0005] A serious disadvantage of the locking device according to FR 2,653,480 is that in case power supply is interrupted while the electro-motor is moving the latch in a closed position, the fail-safe mechanism will fail to open the locking device for the reason that the electromotor needs to be decoupled from a spindle actuating the latch first. As such it is clear that this locking device is not applicable for access control to access points that need to open and close on a regular basis.

[0006] WO 2008/094039 discloses a fail-safe locking device that will always open upon interruption of the power supply.

[0007] This locking device however has the drawback that it does not allow for a latch to be driven in a longitudinal direction of the housing and requires several holes to be provided in a door for placing the lock. Hence installation is cumbersome and the flexibility as to choose the position of the lock in a door is limited.

[0008] WO 87/04213, EP 0021670 and FR 2879643 disclose locking devices comprising drive means allowing moving a latch between a first position protruding from a frontal end of the lock

housing and a second position wherein the latch is retracted in the housing; and further comprising a deactivation mechanism allowing movement of the drive means from an active position wherein the drive means are enabled to move the latch between the first and second position and a inactive position wherein the latch is retracted in the housing irrespective of its movement by the electrical drive means. The disclosed locking devices however have the disadvantage that the deactivation mechanism to be operated mechanically and will only be activated either manually or by activation of a alarming system. This may result in dangerous situations in case power supply is interrupted and no alarm is generated.

[0009] It is clear from the above that there remains a need for easy to install, versatile and reliable fail-safe locking devices.

SUMMARY OF THE INVENTION

[0010] The present invention addresses the above drawbacks by providing a versatile, easy to install and reliable locking device. The locking device according to the present invention comprises:

1. (a) a tubular housing having a frontal end and a distal end;
2. (b) a latch movable between a first position protruding from the frontal end of the housing and a second position wherein the latch is retracted in the housing;
3. (c) electrically driven drive means for moving the latch between said first and second positions

wherein said locking device further comprises a deactivation mechanism provided in said housing and allowing movement of the drive means or at least part thereof from an active position wherein the drive means are enabled to move the latch between the first and second position and a inactive position wherein the latch is retracted in the housing irrespective of its movement by the electrical drive means.

[0011] The deactivation mechanism is preferably electrically driven and preferably comprises a mechanical actuator for moving the drive means or part thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Figure 1 schematically represents a first embodiment of a locking device according to the present invention in several positions of the locking device

Figures 2 and 3 represent alternative embodiments of the locking device of figure 1 in similar positions thereof.

Figure 4 schematically represents an alternative embodiment of the locking device in figure 1 in similar positions thereof and whereby the deactivation mechanism.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0013] Figure 1 represents a locking device with a tubular housing 1 having a distal end 2 and a frontal end 3. A latch 4 is movable between a first position protruding from the frontal end of the housing (fig. 1b) and a second position retracted in the housing (fig. 1a). Inside the housing, electrical drive means 5 are provided for moving the latch between said first and second positions.

[0014] According to the present invention a deactivation mechanism 6 is provided in the housing, allowing movement of the drive means 5 or at least part thereof from an active position (fig. 1a & b) wherein the drive means are enabled to move the latch 4 between the first and second position and a inactive position (fig. 1c) wherein the latch 4 is retracted in the housing irrespective of its movement by the electrical drive means.

[0015] The housing 1 is preferably made in a rigid material such as steel or aluminum and preferably has a length of no more than 20cm, preferably no more than 15 cm and a diameter of maximally 4 cm, preferably maximally 3 cm, most preferably a diameter of maximally 2,5 cm.

[0016] A rim 7 is provided inside the housing dividing the inner space in the housing in a frontal compartment 8 accommodating the latch 4 and a distal compartment 9 accommodating the deactivation mechanism 6. Preferably a longitudinally extending groove is provided in the inner surface of the housing in said frontal compartment 8.

[0017] At the distal end 3, in particular a distal end plate 10 of the housing several connectors 11 are provided allowing external supply of power to the drive means 5 and deactivation mechanism 6. Control of the drive means 5 is preferably achieved by a control unit comprising a printed circuit board and a memory provided in the housing (not depicted).

[0018] The drive means 5 in this case comprise an electromotor 12, the outgoing ax of which is coupled to a spindle 13 extending axially in the housing, through a hole defined by the inner edge of rim 7.

[0019] The latch 4 is provided with an threaded hole 14 cooperating with the free end of the spindle 13. The latch further preferably comprises an externally directed protrusion 15 cooperating with the above mentioned groove in the frontal compartment of the housing, thereby preventing rotation of the latch 4 in view of the housing 1.

[0020] The deactivation mechanism in this case comprises a spring 16 and a blocking pal 17.

The spring is fixed with one end to the electromotor 12 and with the other end to the distal end plate 10 of the housing, thereby biasing the drive means 5 towards the distal end 2 of the housing 1.

[0021] The blocking pal 17 is positioned to maintain the drive means 5 in an active position against the force exerted by the spring 16 and is mounted pivoting around an axes 18 fixed in the housing. A second axes 19 provided in said pal is fixed to the free end of a rod 20 extending longitudinally in said housing and movable in the axial direction by a solenoid 21 electrically powered through a connector 11.

[0022] The functioning of the locking device is rather simple and straight-forward. Figure 1a represents the locking device in an active open position, whereby the latch is retracted in the housing and the drive means are maintained in an active position by pal 17. In this position, the solenoid 21 is electrically powered.

[0023] By activation of the drive means, the spindle 13 is rotated and the latch is forced out of the housing to a closed position of the locking device. By driving the electromotor in an opposite sense, the spindle is winds itself inside the latch, thereby retracting the latch inside the housing.

[0024] When the locking device is in a closed position and a power interruption occurs, the rod 19 is forced to move towards the frontal end of the housing by the solenoid, thereby pivoting the pal 17 and releasing the drive means 5 which is retracted in a distal (second) position under the force of spring 16. The movement of the drive means in a distal position will automatically retract the latch in an open position of the locking device as shown in figure 1c.

[0025] To reactivate the lock, the drive means 5 need to be actuated such that the electromotor winds itself on the spindle against the force of spring 16 into its active position. Meanwhile power supply to the deactivation mechanism is restored and the pall 17 will maintain the drive means 5 in the active position. The locking device is now open with the latch retreated in the housing as shown in figure 1a.

[0026] It is noted that the deactivation mechanism can also be actuated by means of a mechanical movement of rod 20 (in this case pushing it towards the frontal end of the housing). Therefore rod 20 preferably protrudes from the distal end of the housing.

[0027] Figures 2a-c represent an alternative embodiment of the locking device according to the present invention, wherein the solenoid of the deactivation mechanism in the above embodiment is replaced by an electromagnet 22 fixed on the distal surface of rim 7 and a permanent magnet 23 on the distal surface of which the electromotor 12 is fixed. When power is supplied to the electromagnet, the permanent magnet 23 and the electromotor are maintained frontally in the distal compartment 8, whereas in case of interruption of the power supply, the electromotor 12 and permanent magnet 23 are retracted by spring 16 in an inactive position of the drive means towards the distal end of the distal compartment 8.

[0028] Clearly the permanent magnet and electromagnet can be switched mutually without changing the functioning of the locking device.

[0029] Figures 3a-c represent a third embodiment of a locking device according to the present invention wherein the electromotor 12 of the drive means is incorporated in the latch 4 and where the deactivation mechanism comprises an electromagnet 22 and a permanent magnet 23 that is movable in the housing and comprises a threaded hole cooperating with the spindle 13 of the drive means. In this case the permanent magnet is fixed to the spring 16 to retract the permanent magnet and hence the spindle, the electromotor and latch distally in case of a power interruption.

[0030] It is further preferred that the locking device comprises a lock position sensor 24 provided at the frontal end of the housing and having a counterpart 24' provided in a strike plate 25 of the locking device. Such lock position sensor can for example comprise a magnet provided in the strike plate and a RFID tag in the housing, whereby in case the RFID is positioned in front of the magnet, an electric current is generated in the tag.

[0031] The RFID tag is in this case electrically coupled to a control unit for activation of the electromotor. Preferably the lock position sensor is comprises a unique key coupling between the part provided in the strike plate and the part comprised in the housing such that accidental or unauthorized activation of the lock position sensor can be prevented.

[0032] When in this case the lock position sensor detects the presence of the magnet, a signal is generated and received by the control unit that in turn will activate the electromotor to turn and move the latch out of the housing in a closed position of the locking device (figures 1b, 2b and 3b).

[0033] To open the locking device, two options are available. In normal operation, unlocking can be achieved by an external signal (for example from a badge reader) to the control unit, thereby actuating the electromotor to turn and retract the latch (figure 1a, 2a and 3a).

[0034] Figure 4 represents another alternative embodiment of a lock device according to the invention, whereby the locking device is manufactured as a kit-of-parts. The first part is the actual locking device as depicted in Fig 4a, comprising a tubular housing 1 having a distal end 2 and a frontal end 3. A latch 4 is movable between a first position protruding from the frontal end of the housing (fig. 1b) and a second position retracted in the housing (fig. 1a). Inside the housing, electrical drive means 5 are provided for moving the latch between said first and second positions.

[0035] Again, according to the present invention a deactivation mechanism 6 is provided in the housing, allowing movement of the drive means 5 or at least part thereof from an active position (fig. 4a & b) wherein the drive means are enabled to move the latch 4 between the first and second position and a inactive position (fig. 4c) wherein the latch 4 is retracted in the

housing irrespective of its movement by the electrical drive means.

[0036] In figure 4a, the deactivation mechanism comprises a plate 26 that is movable in the housing and comprises a threaded hole cooperating with the spindle 13 of the drive means. In this case the plate 26 is fixed to the spring 16 to retract the plate 26 and hence the spindle, the electromotor and latch distally in case the deactivation mechanism is activated.

[0037] The deactivation mechanism comprises said plate 26 and a slider 27, said plate 26 comprising a bore hole wherein a pal 28 is provided that is biased by a spring 29 in a direction wherein the pal 28 protrudes out of said bore hole thereby cooperating with a slot 30 provided in the inner surface of the housing. The slider 27 is movable in a longitudinal direction between the plate and the housing, between a position wherein it is distant from the pal 28 extending into the slot 30 and a position wherein the slider forces the pal inside the bore hole in the plate 26.

[0038] When the pal 28 protrudes inside the slot 30, the plate 26 is prevented from moving backwards in the housing under the force exerted by spring 16, however when the pal 28 is forced inside plate 26, plate 26 will be retracted, thereby deactivating the lock in a same manner as explained supra with reference to figure 3.

[0039] In figure 4a, the slider 27 is operated by means of a cable connected to a manually operated lock cylinder.

[0040] In figure 4b, a second part (fail safe module) of the kit-of-parts is provided at the distal end of the housing of the first part. The second part comprises electrically driven means cooperating with the deactivation mechanism in the actual locking device to keep the drive means in the active position, interruption of the power supply to the electrical driven means in the second part triggering the deactivation mechanism in the first part causing the drive means to move to the inactive position.

[0041] In the present case, the second part comprises a tubular housing 31 connected to the housing of the first part. In said housing 31 of the second part a pivoting pusher 32 is provided cooperating with the slider 27 of the first part of the locking device.

[0042] Said pivoting pusher 32 is a fixed to the free end of a rod 33 extending longitudinally in said housing and movable in the axial direction by a solenoid 34 electrically powered through a connector 35.

[0043] When the locking device is in a closed position and a power interruption occurs, the rod 33 is forced to move towards the frontal end of the housing by the solenoid 34, thereby pivoting the pusher 32 forward and hence forcing the slider 27 between the housing and the plate 26 in the first part of the lock, such that pal 28 is forced inside the plate 26 and said plate is retracted in the housing, thereby also moving the spindle, the electromotor and latch distally in case of a power interruption. The movement of the drive means in a distal position will

automatically retract the latch in an open position of the locking device as shown in figure 4c.

[0044] The housings of the first and second part of the kit-in-parts represented in figures 4b and 4c preferably connected firmly by means of a snap fit ensuring that the pusher 32 and slider 27 cooperate properly.

[0045] It is clear that the kit-in-parts as represented in figure 4 allows to provide a same locking device in either fail-secure mode (Fig. 4a) wherein in case of power supply a lock remains closed unless manually deactivated (the electromotor will not function in case of a power interruption hence the latch will remain in a closed position of the locking device in case of a power interruption) or in a fail-safe mode (Figures 4b and 4c) wherein a deactivation mechanism is provided that is automatically activated in case of a power interruption.

[0046] It is clear that due to its tubular housing, due to the axial alignment of the electromotor and the latch in the housing and the distal positioning of the connectors for both the solenoid and the electromotor and/or control unit, installing the locking device is very simple. Indeed, inserting the locking device in a side wall of a door only requires providing a circular hole wherein the locking device can be positioned and subsequently fastened. Moreover the movement enabled by the drive means and by the deactivation mechanism are both oriented in a same direction allowing a very compact housing design.

[0047] In order to adjust the position of the lock in view of the distance between the door and the frame a simple sliding of the locking device in the circular hole suffices. Moreover, the lock can be easily mounted in the frame of a door with the strike plate provided in the door itself. Such set up has the additional benefit that the locking device may create an additional anchoring of the frame in a wall thereby strengthening the frame.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- FR2653480 **[0003] [0004] [0005]**
- WO2008094039A **[0006]**
- WO8704213A **[0008]**
- EP0021670A **[0008]**

- FR2879643 [0008]

PATENTKRAV

1. Låselåseanordning omfattende:

(a) et rørformet hus (1) med en frontal ende (3) og en distal ende (2);

(b) en pal, der kan bevæges mellem en første position, der rager frem fra den frontale ende af huset, og en anden position, hvor palen (4) er trukket tilbage ind i huset;

(c) elektrisk drevne drivmidler (5) til bevægelse af palen mellem den første og den anden position,

hvor låseanordningen endvidere omfatter en deaktiveringsmekanisme (6), der er tilvejebragt i huset og som muliggør bevægelse af drivmidlerne (5) eller mindst en del deraf fra en aktiv position, hvor drivmidlerne aktiveres til at bevæge palen (4) mellem den første og den anden position og en inaktiv position, hvor palen (4) trækkes tilbage i huset uanset dens bevægelse ved hjælp af de elektriske drivmidler (5), hvilken deaktiveringsmekanisme (6) omfatter en fjeder, der forspænder drivmidlerne (5) til den inaktive position, kendetegnet ved, at deaktiveringsmekanismen (6) er elektrisk drevet, hvorved den elektriske deaktiveringsmekanisme (6) holder drivmidlerne (5) i den aktive position, hvor afbrydelse af strømforsyningen til deaktiveringsmekanismen (6) bevirker, at drivmidlerne (5) bevæges til den inaktive position.

2. Låseanordning ifølge krav 1, hvor deaktiveringsmekanismen (6) omfatter en mekanisk aktuator til bevægelse af drivmidlerne eller en del deraf.

3. Låseanordning ifølge et hvilket som helst af de foregående krav, hvor deaktiveringsmekanismen (6) omfatter en elektromagnet (22) og en permanentmagnet (23), hvor én af disse magneter muliggør blokering af mindst en del af de elektriske drivmidler i en aktiv position.

4. Låseanordning ifølge et hvilket som helst af de foregående krav, hvor drivmidlerne omfatter en elektrisk motor (12) og en spindel (13) drevet af motoren.

5. Låseanordning ifølge krav 4, hvor spindlen (13) er koblet til palen (4).

6. Låseanordning ifølge krav 4, hvor motoren (12) er fastgjort på en magnet af deaktiveringsmekanismen (6) og til en fjeder (16), der forspænder motoren i en inaktiv position

deraf, således at, efter en afbrydelse af strømforsyningen til deaktiveringsmekanismen (6), magneten og elektromagneten frakobles og motoren (12) bevæges ved hjælp af fjederen (16) mod den distale ende (2) af huset.

7. Låseanordning ifølge krav 1, hvor drivmidlerne endvidere omfatter et modelement, der går i indgreb med den frie ende af spindlen.

8. Låseanordning ifølge krav 7, hvor modelementet er koblet til eller udført som en magnet (23) af deaktiveringsmekanismen, og hvor modelementet er forspændt af fjederen (16) og kan bevæges mellem en aktiv og en inaktiv position for drivmidlerne.

9. Låseanordning ifølge krav 1, hvor huset omfatter én eller flere konnektorer (11) til at koble låseanordningen til en strømforsyning og/eller til et mekanisk aktiveringsmiddel, hvorved samtlige konnektorer placeres ved den distale ende af huset.

10. Låseanordning ifølge krav 1, der endvidere omfatter anslagsplade (25), der omfatter en spalte til modtagelse af palen, når den er i en lukket position for låseanordningen.

11. Låseanordning ifølge krav 10, hvor en læseenhed (24, 24') er tilvejebragt i huset til at bestemme husets position i forhold til anslagspladen.

12. Låseanordning ifølge krav 11, hvor læseenheden (24, 24') er forbundet med en styreenhed, der styrer de elektriske drivmidler.

13. Låseanordning ifølge et hvilket som helst af de foregående krav, hvor bevægelsen aktiveret af drivmidlerne og af deaktiveringsmekanismen begge er orienteret i en samme retning.

14. Kit i dele, der omfatter en første del og en anden del, hvor den første part er en låselåseanordning omfattende:

a. et rørformet hus (1) med en frontal ende (3) og en distal ende (2);

b. en pal (4), der kan bevæges mellem en første position, der rager frem fra den frontale ende af huset, og en anden position, hvor palen er trukket tilbage ind i huset;

c. elektrisk drevne drivmidler (5) til at bevæge palen mellem den første og den

anden position, hvor låseanordningen endvidere omfatter en deaktiveringsmekanisme (6), der er tilvejebragt i huset og som muliggør bevægelse af drivmidlerne (5) eller mindst en del deraf fra en aktiv position, hvor drivmidlerne er aktiveret til at bevæge palen (4) mellem den første og den anden position og en inaktiv position, hvor palen er trukket tilbage ind i huset uanset dens bevægelse ved hjælp af de elektriske drivmidler, hvilken deaktiveringsmekanisme (6) omfatter en fjeder (16), der forspænder drivmidlerne i den inaktive position;

kendetegnet ved, at den anden del omfatter elektrisk drevne midler, der samarbejder med deaktiveringsmekanismen (6) i låseanordningen for at holde drivmidlerne (5) i den aktive position, hvor afbrydelse af strømforsyningen til de elektrisk drevne midler (5) i den anden del udløser deaktiveringsmekanismen (6) i den første del, hvilket bevirker, at drivmidlerne bevæger sig til den inaktive position.

DRAWINGS

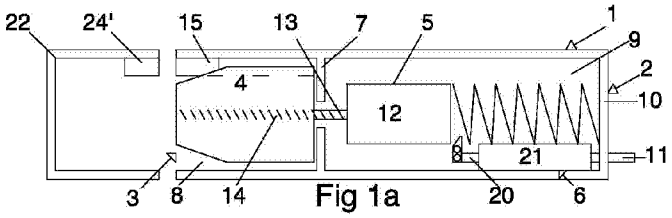

Fig 1a

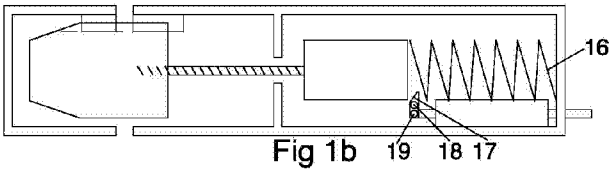

Fig 1b

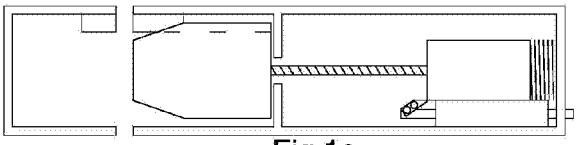

Fig 1c

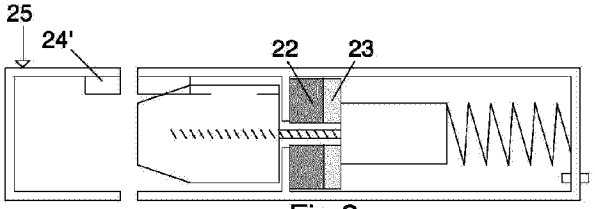

Fig 2a

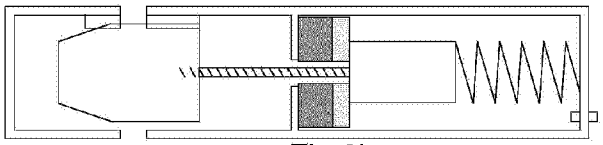

Fig 2b

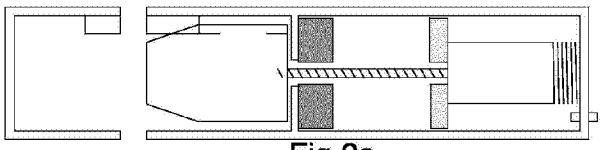

Fig 2c

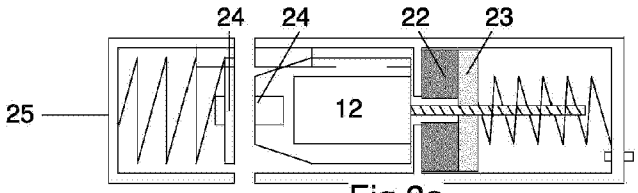

Fig 3a

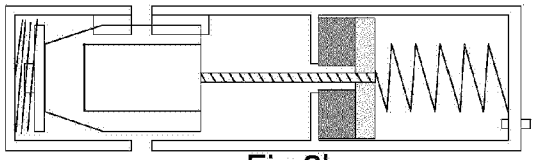

Fig 3b

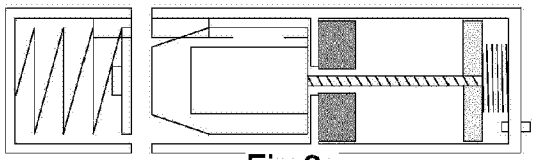

Fig 3c

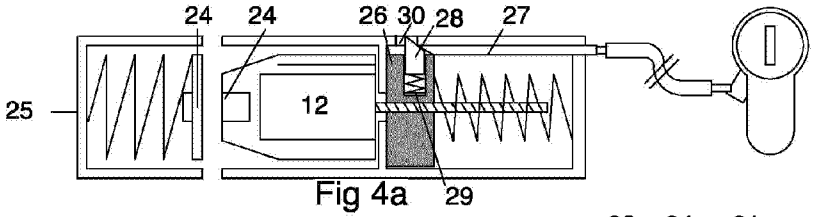

Fig 4a

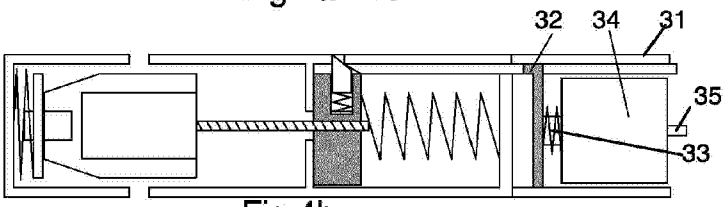

Fig 4b

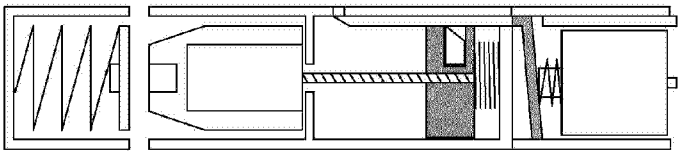

Fig 4c