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(54) DOOR LOCK, ESPECIALLY IN A LOCKER IN A COLLECTIVE DEPOSIT BOX, REMOTELY CONTROLLED BY AN ACCESS CODE

(57) The lock contains a one-sided electromagnetic actuator (8) built inside a box housing (1), whose core (8.1) drives the ejector lever (4) of the lever system (4, 3, 7), which is mounted on the pivot (1.1) of the housing (1) and which, through the holes in the front wall (2) of the housing (1), blocks the door (9) of the box with the end of the hook (3.1) of the latch (3) and pushes the door (9) away from the front wall (2) with the foot (4.1) of the ejector (4). The electromagnetic actuator (8) with the movable core (8.1) is directed towards the rear edge of the ejector (4). The latch (3) and the ejector (4) are loaded with a spiral spring (6) mounted on the pivot (1.1) in the direction of locking the hook (3.1) of the door (9) and retracting the foot (4.1) of the ejector (4). The hook (3.1) behind the front wall (2) is covered from the front and on both sides by the walls of the hook cover (7) mounted on the pivot (1.1) and guided in the hole of the front wall (2). The essence of the invention lies in the fact that the lever system consists of two separate, flat lever elements of the latch (3) and the ejector (4), which adjoin each other with the front surfaces and are pivotably mounted on the pivot (1.1) of the housing (1) and which act on each other through protruding pins (3.2, 4.2) in such a way that after tilting the hook (3.1) of the latch (3) by the action of the electromagnetic actuator (8) and opening the ejector with the foot (4.1) of the box door, the hook (3.1) of the latch (3) returns back to the closed position under the action of the spiral spring (6).

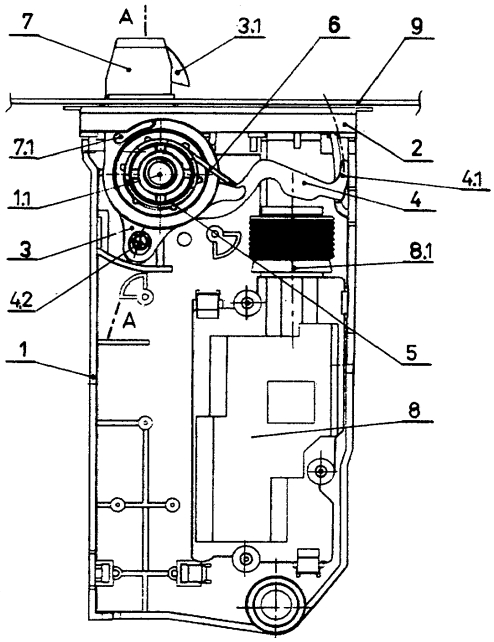

FIG.1

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Description

[0001] The subject of the invention is a door lock, especially in a locker in a collective deposit box, remotely controlled by an access code: digital letter, transponder or barcode / biometric scanner. The lock is used especially in self-service transceiver lockers for postal parcels, equipped with a control unit with a terminal, screen and keyboard.

[0002] Known from the patent description PL 221985 B1, the lock for safe deposit boxes includes a one-sided electromagnetic actuator built inside the box housing, whose core drives a two-arm lever with a shape similar to the letter "L", which is rotatably mounted on the housing pivot in the corner area of both lever arms. The bearing hole in the lever has an elongated shape with an axis of symmetry perpendicular to the plane of the front wall. The lever locks the door of the box with the hook through the ends protruding through holes in the front wall of the housing and the ejector foot at the end of the longer arm -with the shape of a leg bent at the knee - pushes the door out from the front wall after raising the hook by the action of the electromagnetic actuator. The actuator core faces the rear edge of the longer arm of the lever on the ejector side. The two-arm lever is loaded with a spiral spring, with one end attached to the housing pivot and the other one hooked on the longer arm on the ejector side - acting by force of tension in the direction of the door hook lock and retractor foot retraction. In addition, the hook behind the front wall is covered from the front and on both sides by the walls of the hook cover, which is mounted on the housing box pivot and supported in the hole of the front wall. At the end of the hook there is a locking tooth protruding outwards, which when attempting to break in and advancing forward the hook is inserted under the bottom edge of the hook cover, which blocks its lifting and the possibility of opening the door.

[0003] The solution with one lever, which performs two tasks with a time offset during a fast, unregulated door opening movement and, accordingly, when closing the door manually - requires precise selection of the lever geometry and the use of an electromagnetic actuator with a correspondingly increased stroke.

[0004] The lock according to this invention has many features in common with the above-described solution, but it is distinguished by the fact that its lever system consists of two separate, flat lever elements: latch and ejector, adjacent by faces and bearing mounted on the pivot of the housing and acting on each other through protruding pins so that after swinging the latch hook by the action of the electromagnetic actuator and opening with the ejector foot of the box door, the hook returns to the closed position under the action of the spiral spring.

[0005] It is preferable to make a lock with a latch, which has a ring with a hole with a diameter larger than the diameter of the pivot and has an arm ended with a hook connected on the circumference of the ring and a sliding arm connected of a spiral spring with a working edge parallel to the hook's hooking surface; in addition, at the bottom edge of the arm under the hook it has a thrust socket.

[0006] In another preferred embodiment, the latch on the arm ended with a hook has a locking pin attached to the radial groove in the adjacent wall of the hook cover to a depth greater than the diameter of the locking pin.

[0007] It is also advantageous if the latch ring is cut out in the range between the hook-ended arm and the sliding arm, and on the opposite side of the hookarm it has an arm with a bean groove connected to the ring, positioned with its axis perpendicular to the working edge of the sliding arm of the spiral spring.

[0008] It is preferable to make a lock with an ejector that has a ring with a hole with a diameter that is rotatably tolerated relative to the diameter of the pivot of the housing, and to which an arm with a foot is attached on the circumference of the ring and a projection with the attached driver pin protruding towards the latch and which is located relative to the ring axis on the foot side and on a radius equal to the position of the thrust socket In another preferred embodiment, the ejector ring is connected by a guide pin arm, which is located on the opposite side and in the axis of the ring guided by the driver pin and protrudes towards the latch and is inserted into its bean groove.

[0009] The hook cover in the lock according to the invention is an element of sheet metalbent into a U-shaped profile and its side walls are finished with rings with coaxial holes and a diameter that is rotatably tolerated with respect to the diameter of the housing pivot.

[0010] Preferably, in the hook cover wall adjacent to the latch there is a radial groove with an axis equal to the radius of the locking pin and which at the upper end is connected with the locking groove perpendicularly directed outside.

[0011] The lock made according to the above-mentioned technical features with a lever system consisting of two interacting levers allows for efficient execution of tasks by the titled latch and door ejector. After opening the door and retracting the actuator core, the latch hook under the action of a spiral spring is set to a closed position and when manually closing the door, it is tilted independently of the ejector. In basic anti-burglary versions, with the latch hook locking when attempting to break into the box by leverage tiling of the door with a crowbar inserted into the created gap with the frame, there is a simultaneous shift of the latch hook forward and insertion of the locking wheel into the perpendicular groove on the side wall of the hook cover - which prevents further shift of the hook and door opening.

[0012] The lock according to the invention is approximated by the description of two exemplary embodiments shown in the drawing. Figures 1 to 7 show the lock according to the first embodiment:

Fig. 1 - front view of the lock with the housing cover removed,

Fig. 2 - cross section according to the A-A linein Fig. 1

Fig. 3 - front view of the hook cover,

Fig. 4 - front view of the elements of the lock lever system in a coaxial arrangement with the pivot,

Fig. 5 - location of elements of the lock lever system in the door open position, with the hook cover removed,

Fig. 6 - location of elements of the lock lever system in the burglary test position with the door ajar and the hook cover removed,

Fig. 7 - location of elements of the lock lever system in the burglary position with the door ajar and attempt to move the hook covered by the hook cover.

Figures 8 and 9, in turn, show the lock according to the second exemplary embodiment:

Fig. 8 - front view of the elements of the lock lever system in a coaxial arrangement with the pivot,

Fig. 9 - location of elements of the lock lever system in the burglary test position with the door ajar and the hook cover removed.

[0013] In both of the exemplary embodiments described below, the lock has a structure that significantly limits the possibility of unauthorized intrusion into the deposit box locker, of course without the use of extremely destructive actions. The lock according to the invention consists of: box housing 1, attached with the front wall 2 to the door frame 9 of the box, and embedded inside the housing 1: an electromagnetic actuator 8 driving a movable core 8.1 a lever system, which consists of a latch 3 and an ejector 5, bearing mounted on the pivot 1.1 of the housing 1 and axially loaded with spiral spring 6 in door closing position 9 with the hook 3.1 of the latch 3 and retracting foot 4.1 ejector 4.

[0014] The latch 3 in this version of the lock has a ring with a hole with a diameter "d1" larger than the diameter "d" of pivot 1.1 and has an arm ended with a hook 3.1, connected on the circumference of this ring and a sliding arm 3.5 of a spiral spring 6, with a working edge parallel to the hook surface 3.1. Furthermore, at the bottom of the arm's edge under the hook 3.1 it has a retaining slot 3.4, and slightly above a rigidly mounted locking pin 3.2, which penetrates into the radial groove 7.1 of the adjacent wall of the hook cover 7. In the first exemplary embodiment, the latch ring 3 is cut out in the range between the hook-ended arm 3.1 and the sliding arm 3.5. In addition, on the opposite side of the arm with the hook 3.1 it has an arm connected to the ring with a bean groove 3.3, arranged in an axis perpendicular to the working edge of the sliding arm 3.5.

[0015] The ejector 4 has a ring with a hole with a diameter that is rotatably tolerated relative to the diameter d of the pivot 1.1 of the housing 1, and to which an arm with a foot 4.1 is attached on the circumference of the ring and a projection with the attached driver pin 4.3 protruding towards the latch 3 and which is located relative to the ring axis on the foot side 4.1 and on a radius equal to the position of the thrust socket 3.4. The ejector ring 4 is connected by a guide pin arm 4.2, which is located on the opposite side and in the axis of the ring guided by the driver pin 4.3 and protrudes towards the latch 3 and is inserted into its bean groove 3.3.

[0016] The element cooperating with the lever system is the hook cover 7, made by bending metal sheet into a U-shaped profile. Its side walls are finished with rings with coaxial holes and a diameter that is rotatably tolerated with respect to the diameter d of the pivot 1.1 of the cover 1. In the wall adjacent to the latch 3 it has a radial groove 7.1 with an axis equal to the radius of the locking pin 3.2 and which at the upper end is connected with the locking groove perpendicularly directed outside 7.2.

Description of lock operation

[0017] The operation is explained by a short description of displacements and positions of lock elements in characteristic positions of:

a. closing

b. authorized opening

c. burglary attempt.

Ad. a

[0018] In the closed door position 9 shown in Fig. 1, the hook 3.1 of the latch 3 locks the door 9 manually pressed against the front wall 2 of the lock. When closing, the pressure of the hole edge in the door 9 on the curvature of the outer surface of the hook 3.1 causes that the latch 3 is moved towards the lock and the lock pin 3.2 is inserted into the radial groove 7.1 - which, with further closing motion, allows the hook 3.1 to be hidden in the inner space of the cover 7 and pressing the door 9 against the front wall 2. Spiral spring 6 pulls the hook back 3.1 into the door closed position 9.

Ad. b

[0019] After entering the code compliant with the authorized code into the control system, the output signal activates the electromagnetic actuator 8, whose core 8.1 rotates the ejector 4 around the pivot 1.1 of the housing 1. counterclockwise. The contact of the driving pin 4.3 attached to the ejector 4 with the retaining slot 3.4 of the latch 3 causes in the further movement the joint rotation of those elements. After tilting the hook 3.1 to the door

release position 9 in the final phase of actuator core movement 8.1, the ejector foot 4.1 hits door 9 causing that it opens. In the lever system of the lock, the return movement occurs under the pressure of the spiral spring 6, whose pressure on the sliding arm 3.5 of the latch 3 and the ejector 4 brings them to their starting positions. The latch 2 rotates around the "C" point, the guide pin 4.2 leaning on the upper edge of the bean groove 3.3. The position of the lock elements in the open position of the door 9 is shown in Fig. 5 without drawing the hook cover 7.

Ad. c

[0020] When attempting to break in (Fig.6) into a locked box using the crowbar "L" - inserted into the gap between door 9 and the front wall 2 - the door 9 is swung out until it reaches the resistance position resulting from leaning on point "A" of the edge of the latch hole 3 on the pivot 1.1 of the housing 1, which is supported by contact at the "B" point of the guide wheel 4.2 with the bottom edge of the bean groove 3.3. The burglar's next action (Fig. 7) is that with the lilted door the latch 3. hook 3.1 is shifted to the left and it is released from the hook position into the hole clearance zone in the door 9 - lock of the hook 3.1, obtained as a result of inserting during the door 9 tilting phase the lock 3.2 pin into the locking groove 7.2, made in the wall of the hook cover 7, perpendicular to the direction of the burglar.

[0021] The second embodiment of the lock according to the invention, with a structure very similar to the one described above, is very briefly illustrated in figures 8 and 9 of the drawing. This embodiment differs in a simplified structure of the latch 3 and the ejector 4. The latch 3 has a solid ring, without a cut-out between the hook arm 3.1 and the sliding arm 3.5, and has no arm with a bean groove 3.3. The lock operates in a similar manner to the above-described solution according to the first exemplary embodiment of the invention.

[0022] The simplest lock realizing the essence of the invention - without the features of anti-burglary hook lock 3.1 latch 3 - has a full latch ring 3, but without the locking pin 3.2 on the arm with the hook 3.1, without the arm with the bean groove 3.3 and the guide wheel 4.2 and without the radial grooves 7.1 and the lock 7.2 on the hook cover 7. The solution is an obvious simplification of the above described embodiments and does not require additional explanation.

List of markings in the drawing

[0023]

1. housing
   1.1 pivot
2. front wall
3. latch
   3.1 hook
   3.2 lock pin
   3.3 bean groove
   3.4 retaining slot
   3.5 sliding arm
4. extractor
   4.1 foot
   4.2 guide pin
   4.3 driving pin
5. locking ring
6. spiral spring
7. hook cover
   7.1 radial groove
   7.2 lock groove
8. electromagnetic actuator
   8.1 actuator core
9. door
10. hallotron sensor

d. pivot diameter
d1. hole diameter in the latch d2. lock pin diameter
s. locking groove depth
Fe. electromagnetic actuator core strength
Fs. tensioned spiral spring force
A. point of support of the edge of the latch hole with the pivot
B. point of support of the ejector guide pin on the bottom edge of the bean groove
C. point of support of the ejector guide pin on the upper edge of the bean groove

Claims

1. **Lock for the door of the box, especially in the collective deposit locker, remotely controlled by an access code,** including a one-sided electromagnetic actuator (8) built inside the box housing (1) (whose core (8.1) drives the ejector lever (4) of the lever system (4, 3, 7) on the pivot (1.1) of the housing (1) and which locks the box door (9) away with ends of the hook (3.1.) of the latch (3) projecting through the holes in the front wall (2) of the housing (1) and the foot (4.1) of the ejector (4) pushes the door (9) away from the front wall (2) after lifting the hook (3.1) by the electromagnetic actuator (8) with the movable core (8.1)) towards the rear edge of the ejector (4), where the latch (3) and the ejector (4) are loaded with a spiral spring (6) mounted on the pivot (1.1) towards the block with the hook (3.1) of the door (9) and retraction of the foot (4.1) of the ejector (4); in

addition,in the lock, the hook (3.1) behind the front wall (2) is covered from the front side and on both sides by the walls of the hook cover (7) mounted on the pivot (1.1)) and going through the hole in the front wall (2), **characterized in that** the lever system consists of two separate, flat lever elements of the latch (3) and the ejector (4), adjacent to each other by faces and bearing mounted on the pivot (1.1) of the housing (1) and acting on each other through protruding pins (3.2, 4.2) so that after swinging the hook (3.1) by the action of the electromagnetic actuator (8) and after opening the ejector (4) of the box door with the foot (4.1), the hook (3.1) returns to the closed position under the action of the spiral spring (6).

2. The lock according to claim 1, **characterized in that** the latch (3) has a ring with a hole (d1) with a diameter larger than the diameter (d) of the pivot (1.1) and has an arm ended with a hook ((3.1) connected on the circumference of the ring and a sliding arm (3.5) of a spiral spring (6) with a working edge parallel to the hook's hooking surface (3.1); in addition, at the bottom of the arm under the hook (3.1) it has a thrust socket (3.4).

3. The lock according to claim 2, **characterized in that** the latch (3) on the arm ended with a hook (3.1) has a locking pin (3.2) attached to the radial groove (7.1) in the adjacent wall of the hook cover (7) to a depth greater than the diameter of the locking pin (3.2).

4. The lock according to claim 3, **characterized in that** the latch ring (3) is cut out in the range between the hook-ended arm (3.1) and the sliding arm (3.5) and on the opposite side of the hookarm (3.1) it has an arm with a bean groove connected to the ring (3.3), positioned so that its axis is perpendicular to the working edge of the sliding arm (3.5) of the spiral spring (6).

5. The lock according to claim 1, **characterized in that** the ejector (4) has a ring with a hole with a diameter that is rotatably tolerated relative to the diameter (d) of the pivot (1.1) of the housing (1), and to which an arm with a foot (4.1) is attached on the circumference of the ring and a projection with the attached driver pin (4.3) protruding towards the latch (3) and which is located relative to the ring axis on the foot side (4.1) and on a radius equal to the position of the thrust socket (3.4).

6. The lock according to claims 4 or 5, **characterized in that** the ejector (4) has a guide circle arm (4.2) connected to the ring, which is located on the opposite side and in the axis of the ring guided by the driver pin (4.3) and protrudes towards the latch (3)) and is inserted into its bean groove (3.3).

7. The lock according to claim 1, **characterized in that** the hook cover (7) is bent of sheet metal into a U-shaped profile and its side walls are finished with rings with coaxial holes and a diameter that is rotatably tolerated with respect to the diameter (d) of the pivot (1.1) of the cover (1).

8. The lock according to claim 1, **characterized in that** the hook cover (7) in the wall adjacent to the latch (3) has a radial groove (7.1) with an axis equal to the radius of the locking pin (3.2) and which at the upper end is connected with the locking groove perpendicularly directed outside (7.2).

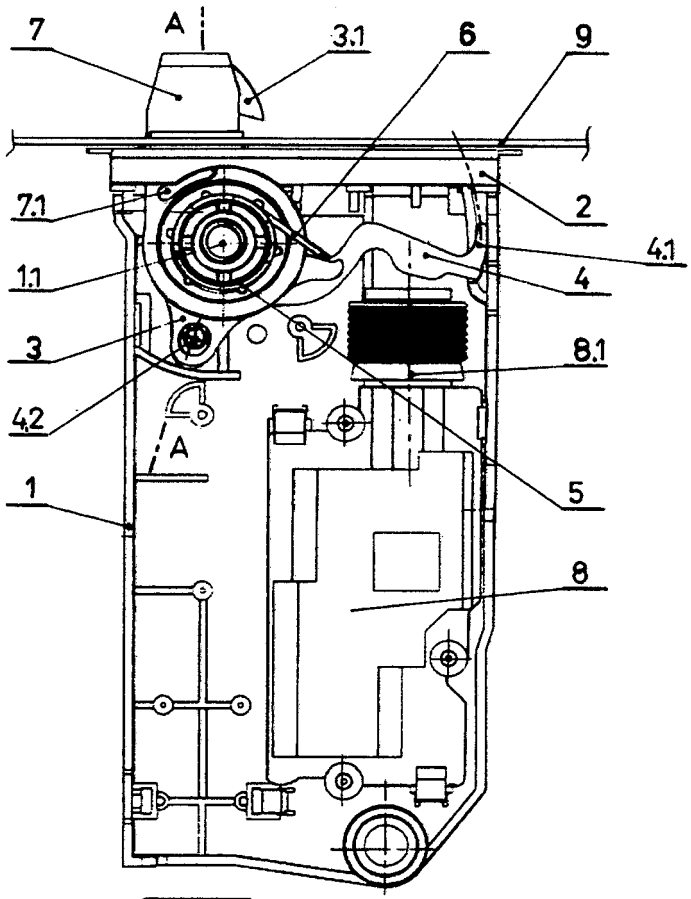

FIG.1

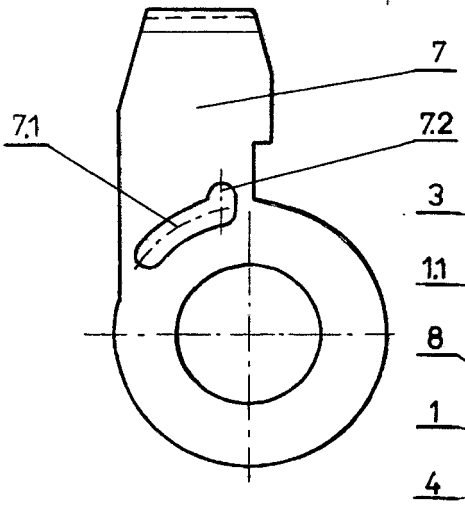

FIG.3

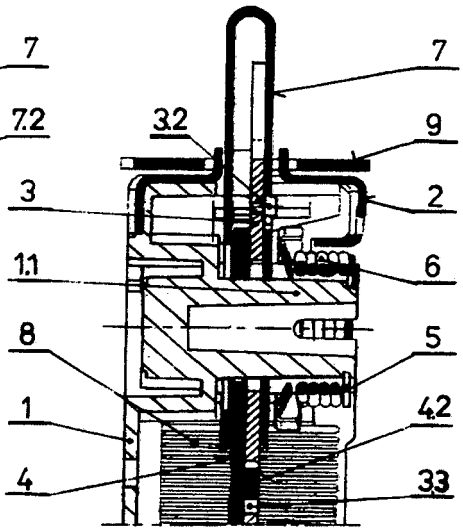

FIG.2

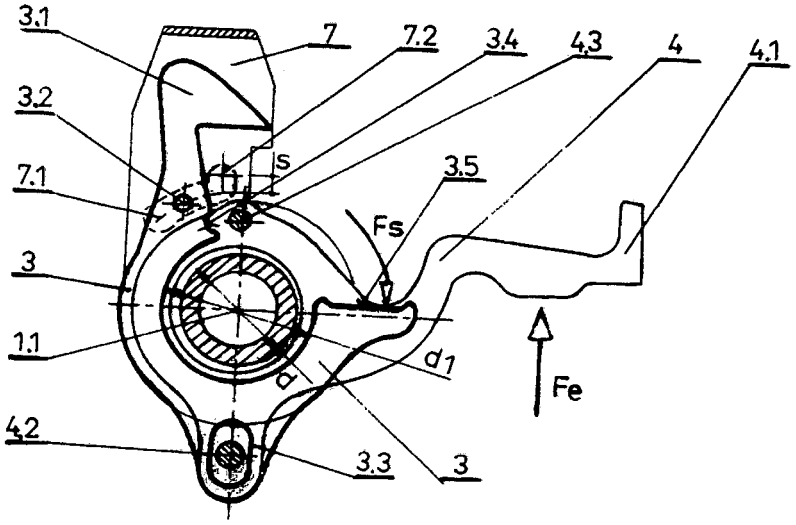
3.1
7
7.2
3.4
4.3
4
4.1
3.2
s
3.5
7.1
Fs
3
1.1
d
d1
Fe
4.2
3.3
3

FIG.4

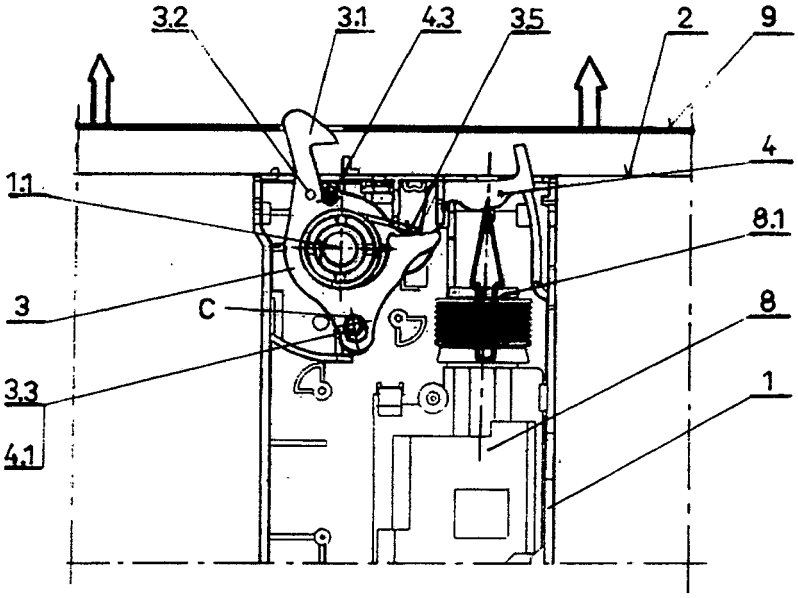
3.2
3.1
4.3
3.5
2
9
4
1.1
8.1
3
C
8
3.3
1
4.1

FIG.5

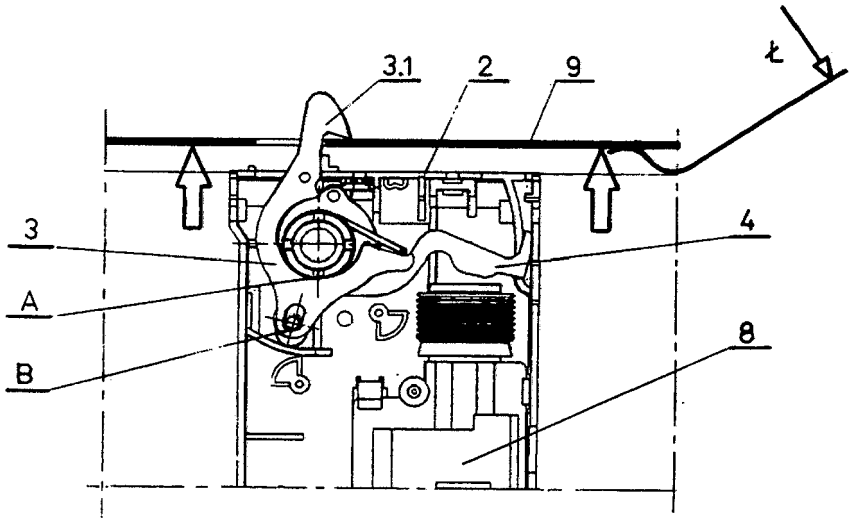

FIG.6

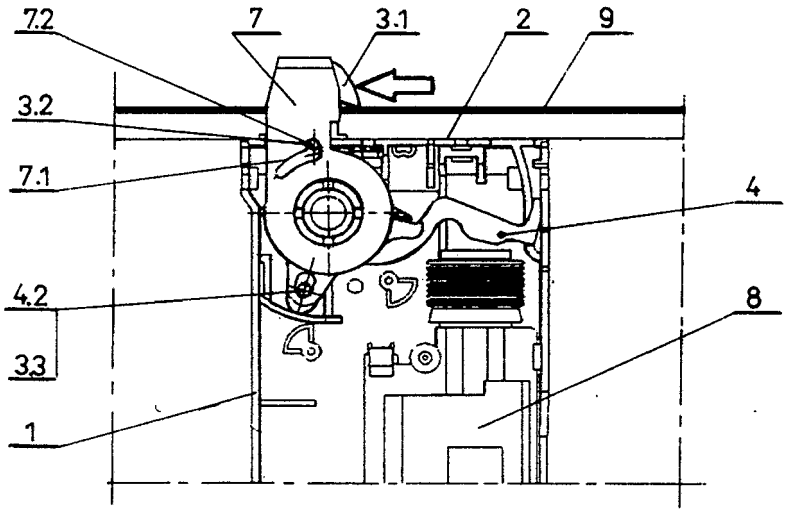

FIG.7

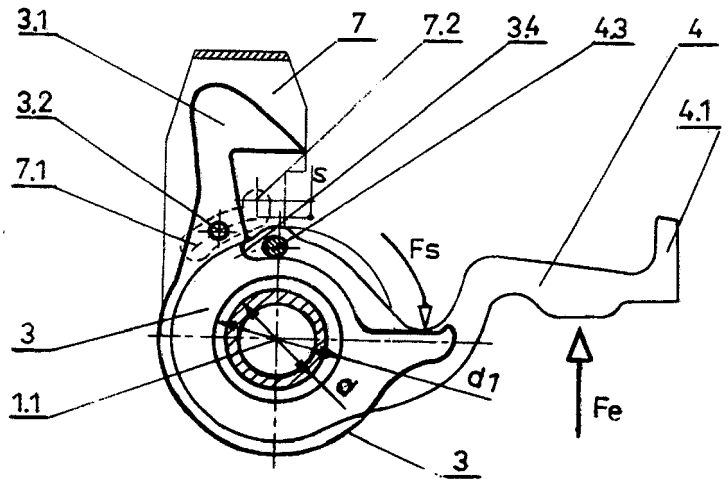

FIG.8

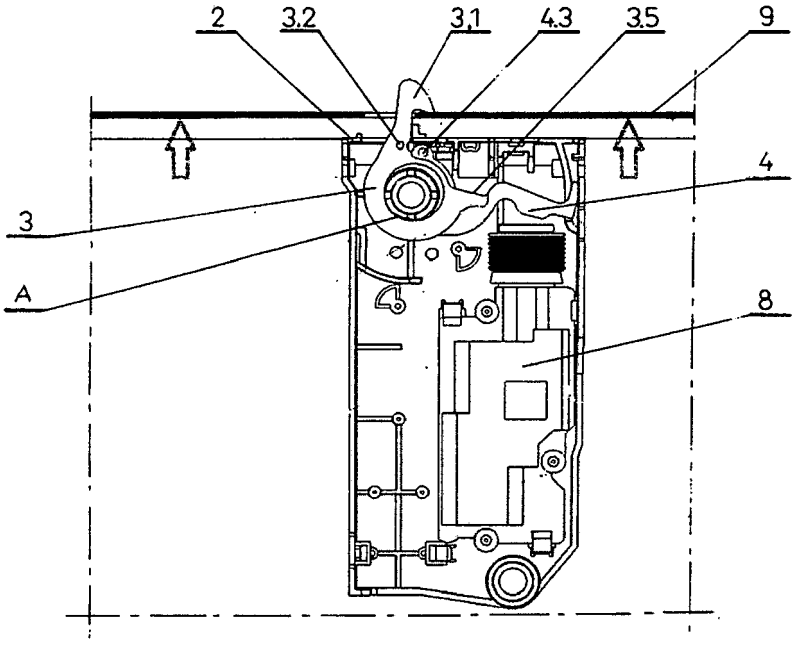

FIG.9

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EUROPEAN SEARCH REPORT

Application Number
EP 19 00 0582

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)
E05B
A47G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 May 2020	Geerts, Arnold

CATEGORY OF CITED DOCUMENTS

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12-05-2020

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