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(54) **ELECTRONIC LOCK "CHIPLOCK"**

(57) The invention provides an electronic lock, in which body 14 there is mounted a bar 1, a bar shifting mechanism including riegel 2 (bolt), a control lever 3 and a blocking mechanism. The latter is made in form of an electromechanical catch which moving plate 11 is coupled to a limiter 8 blocking the bar shifting mechanism. In the present aspect of the electronic lock a power consumption is reduced significantly.

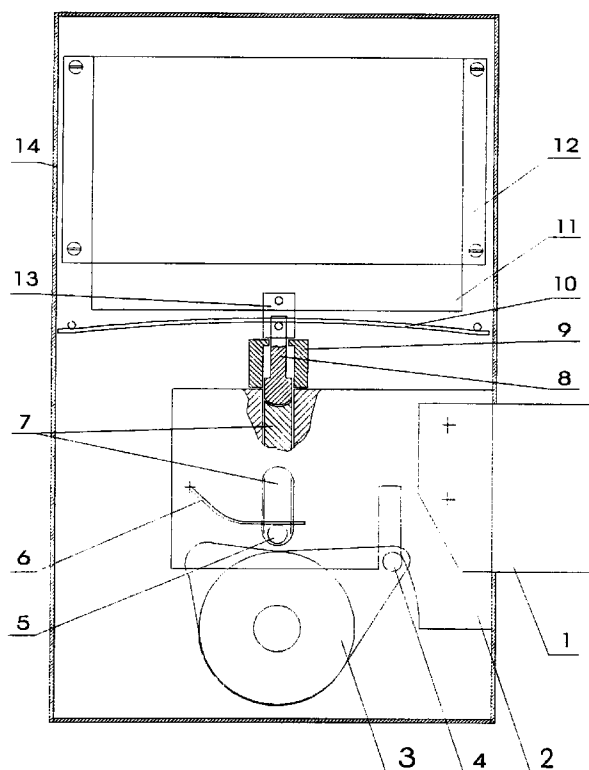


FIG. 1

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Description

Technical field

The invention relates to an automatic that uses fixing mechanisms and locking devices, and particularly to electronic locks for doors, safes, vehicles etc.

Background art

In known electronic locks a control element interacts with a lock bar most often by electromagnets which coils are supplied with electrical signals from enable means (USSR Author's Certificate №1694066, Int. Cl. E 05 B 47/00, published 1990).

A disadvantage of locks of this type is in a power coupling between the bar and the control element, which coupling is performed via a sufficiently powerful electromagnet. Because of a high power consumption of such a lock it may operate only from external mains, or energy-intensive battery.

In another known electronic lock taken as a prior art, an electromagnet is employed only to deblocking the bar and is turned on via a processor by a signal from an electronic key (US Patent № 5005393, Int. Cl. E 05 B 47/00, published 1991).

However, even such a small electromagnet consumes a significant power and in the case of an autonomous power source, it requires to be periodically recharged or replaced thus deteriorating the lock performance.

Disclosure of invention

This invention provides a reduction of a power consumed by the electronic lock.

For this purpose in an electronic lock comprising a bar, a bar shift mechanism, and a blocking device; said blocking device is made in the form of an electromechanical catch including interactive elements mounted with the possibility of their mutual shifting and of their electroadhesive fixing and said blocking device is coupled to a limiter blocking the shift of said bar.

The Applicant does not know locking devices and more particularly electronic locks having the same set of essential features. This permits to consider the present invention being met the PCT criterion of **novelty (N)**.

The Applicant knows systems in which the electroadhesive effect is employed for fixing processed details on a working plate (USSR Author's Certificates № 1291395, Int. Cl. B 25 J 15/06, published 1987; № 1320057, Int. Cl. B 25 J 15/06, published 1987; № 1451000, Int. Cl. B 25 J 15/06, published 1989). However, the employing of the electro-adhesive effect to blocking elements mutually moved in mechanical devices and more particularly in door locks isn't known from the Applicant. This permits to consider the present invention being met the PCT criterion of **inventive step (IS)**.

Reasons of an accordance of the present invention to PCT criterion of **industrial applicability (IA)** will be provided below.

Brief description of the drawings

As an example a simplest variant of an electronic door lock is considered, thus illustrating clearly a technical aspect of this invention.

Fig. 1 to 3 shows, in a schematical view, locations of main units of the electronic lock in different phases of its operating.

Best embodiment of the invention

An embodiment of this invention will be described now with the reference to drawings.

An electronic lock includes a bar 1, a bar shift mechanism consisting of a riegel 2 (bolt) and a control lever 3 having a peg 4. A vertical hole (marked on the local cross-section) is made in a body of the riegel (bolt) 2, in which hole a cylindric pin 7 is inserted having a transversal tip 5 going out of a slot in the lower plane part of the riegel 2 (bolt). The pin 7 is under an effect of a returning spring 6 by means of the transversal tip 5. A bar shifting blocking device has a limiter 8 moved by the pin 7 and a spring 10 in a fixed bush 9 and coupled to a moving plate 11 of the electromechanical catch by a chain 13, a second plate 12 of the catch is fixed in a lock body 14.

The catch plates 11, 12 are divided by a thin dielectric clearance, and in the simplest case the surfaces of that both plates 11, 12, turned one to the other, are produced with a high polishing degree and have a conductivity. From the electrical point of view the catch is equivalent to a capacitor: once a voltage is applied on its plates they are charging by opposite polar charges. As known from the background art and particularly from the above mentioned references, the electrostatic attraction arises between the charged plates 11, 12 leading, under some condition, to a considerable mutual adhesion of these plates 11, 12, that is so called **electroadhesive interaction**. In a shown schematic structure these catch plates 11, 12 are able to move mutually and their mutual location may be fixed at an arbitrary moment due to the electroadhesion, by applying an electrical charge to these plates 11, 12.

Fig. 1 shows a starting state of the electronic lock mechanism. The bar 1 is slid out of the body 14 (the state of "lock is closed"), the limiter 8 of the blocking device is lowered into the vertical hole of the riegel 2 (bolt) by the spring 10 thus blocking a shift of the bar 1.

Fig.2 illustrates "cocking" of the blocking device. When the control lever 3 is turned clockwise, its left cam forces the tip 5 and raises the pin 7 which in its turn raises the limiter 8. In the final position shown in the Fig.2 the pin 7 comes into the fixed bush 9 thus operating as a limiter. The moving plate 11 of the electromechanical catch shifts away from its starting position with regard to the fixed plate 12.

After the control lever 3 is turned counter-clockwise to its starting position there are two possible versions of the whole mechanism to operate.

The first version, "idling", takes place when the catch plates 11, 12 are not supplied by the voltage. In this case an interaction between these plates is absent, and they are free in their mutual movement. The spring 10 lowers the limiter 8 after the pin 7 is lowered to its starting position (Fig. 1).

The second version, "deblocking the lock", takes place when the catch plates 11, 12 are supplied by the voltage big enough for such an electroadhesive coupling of plates 11, 12 that counteracts a force of the tensed spring 10 and thus keeps the limiter 8 in a "cocked" state. The pin 7 is being hid by its returning spring 6 into the vertical hole of the riegel 2 (bolt) enabling it to shift longitudinally.

Fig.3 shows the final state of the lock mechanism. The bar 1 is drew into the lock body 14 (the state of "lock is open"). The longitudinal shift of the bar riegel 2 (bolt) is performed by the peg 4 of the control lever 3 acting onto the vertical slot of the riegel 2 (bolt).

This reciprocating motion of the riegel 2 (bolt) and the bar 1 is possible till the limiter 8 is in the "cocked" position. If the voltage maintaining the electroadhesive coupling of catch plates 11, 12 is removed then the spring 10 returns the blocking mechanism to its starting state at the moment when the vertical hole of the shifted riegel 2 (bolt) comes under the limiter 8.

Industrial applicability

As follows from the given description this invention may be used as the electromechanical blocking mechanism in automatic systems and particularly for its proper purpose, i.e. as an electronic lock for doors of premises, safes, vehicles, etc.

A simple design of the discussed electronic lock allows to produce it in a large-scale production. In addition a use of the electroadhesive effect based on electrostatic interaction of mechanism elements for blocking the mechanisms requires much smaller power consumption unlike of the use of the electrodynamic interaction in known blocking mechanisms having electromagnetic coils.

So this invention allows to use the piezoelectricity (and the triboelectricity, or other types and methods of a quasistatic charge accumulation) to supply electronic locks having electroadhesive blocking devices.

It will be obvious to those skilled in the art that the above description is only one of possible embodiments.

In plural possible design versions the described lock elements: the bar, the bar shifting mechanism, methods for mechanical blocking of the bar shifting mechanism by means of the limiter, the form and the constructions of electroadhesive catch elements etc., may differ.

So, the above mentioned example of the electronic lock implementation is only an illustration and

does not limit in any case the scope of this invention as defined in the claims appended hereto.

Claims

1. An electronic lock comprising a bar, a bar shift mechanism, and a blocking device, **characterized** in that said blocking device is made in the form of an electromechanical catch including interactive elements mounted with the possibility of their mutual shifting and of their electroadhesive fixing and said blocking device is coupled to a limiter blocking the shift of said bar.

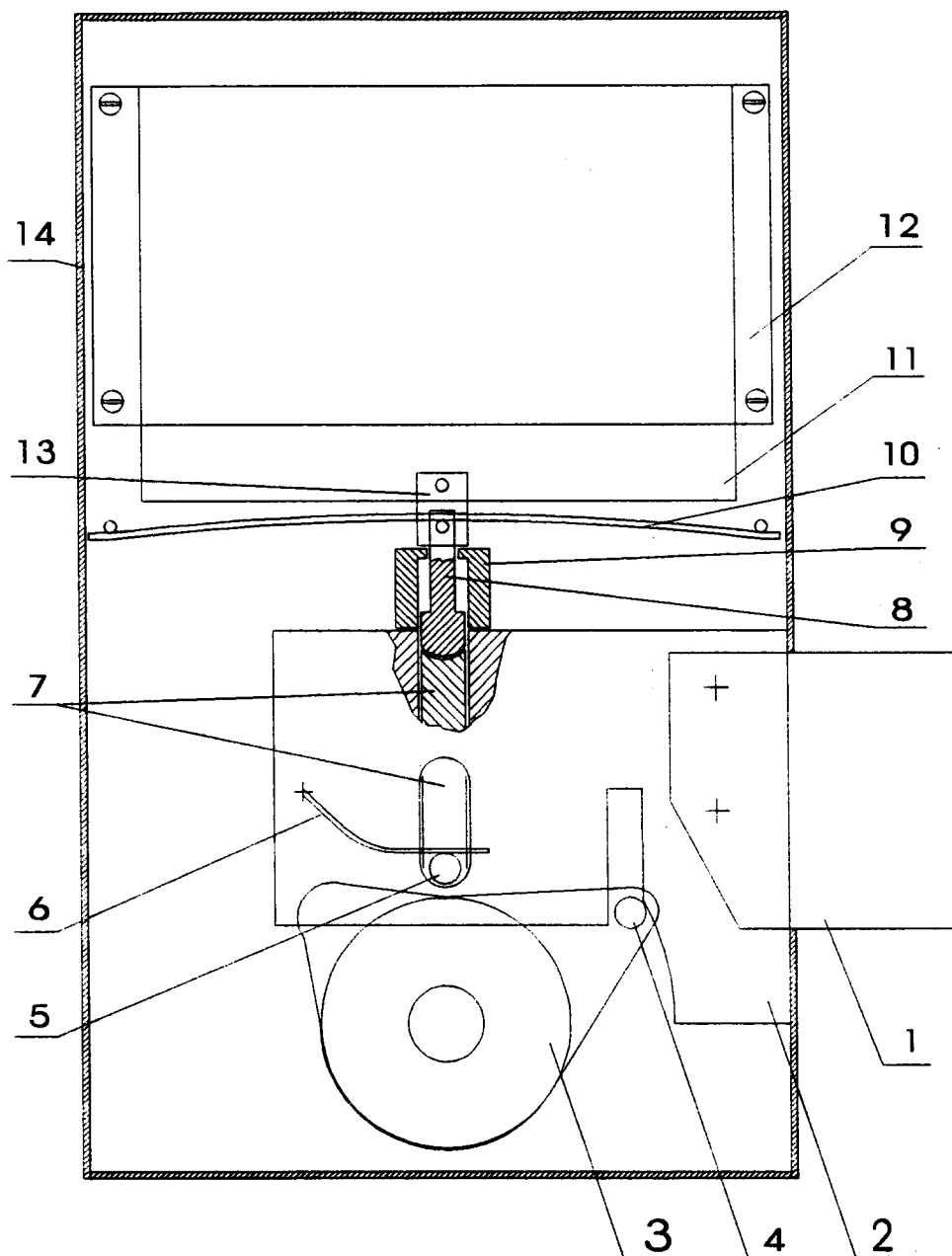


FIG. 1

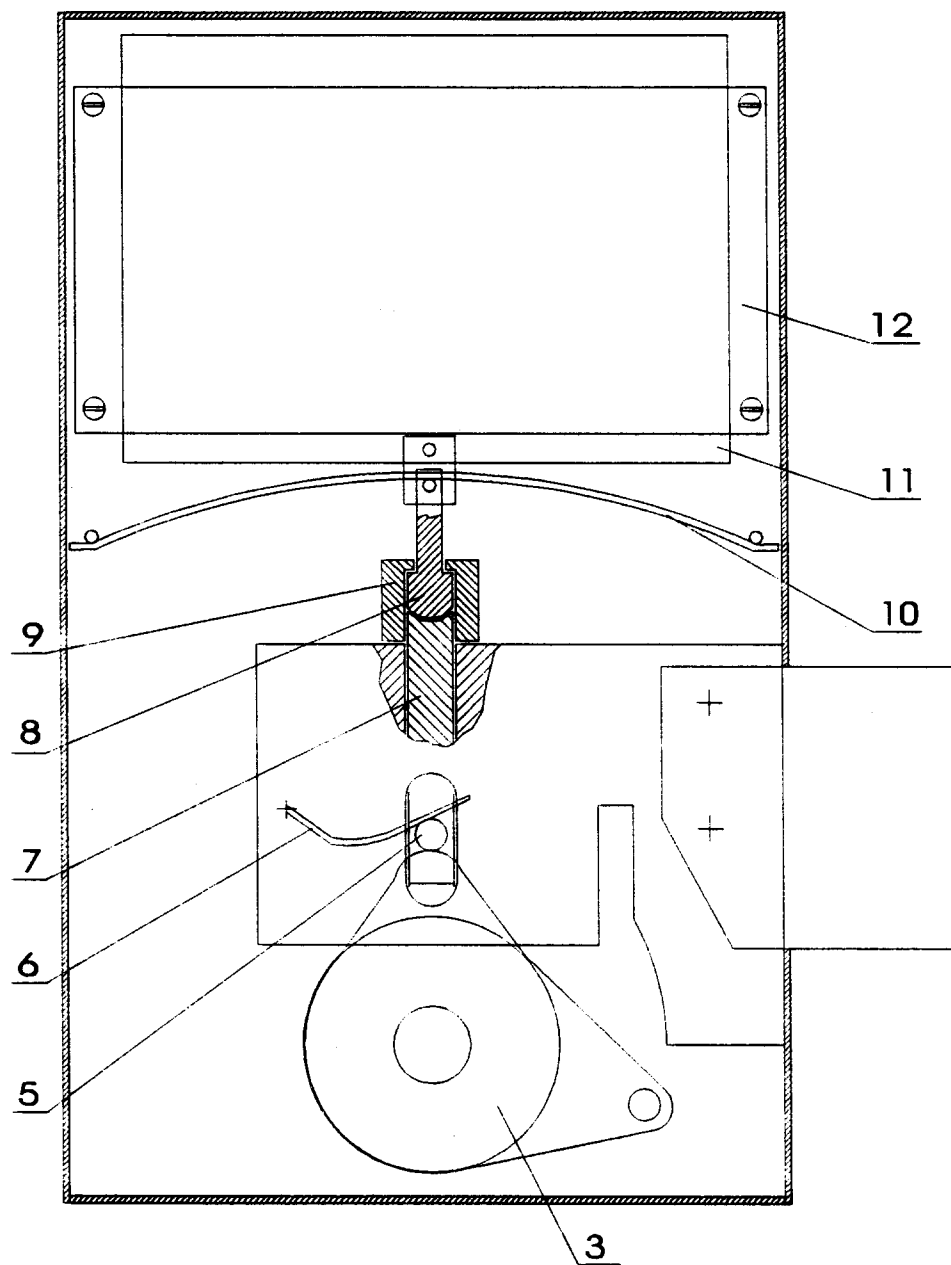


FIG. 2

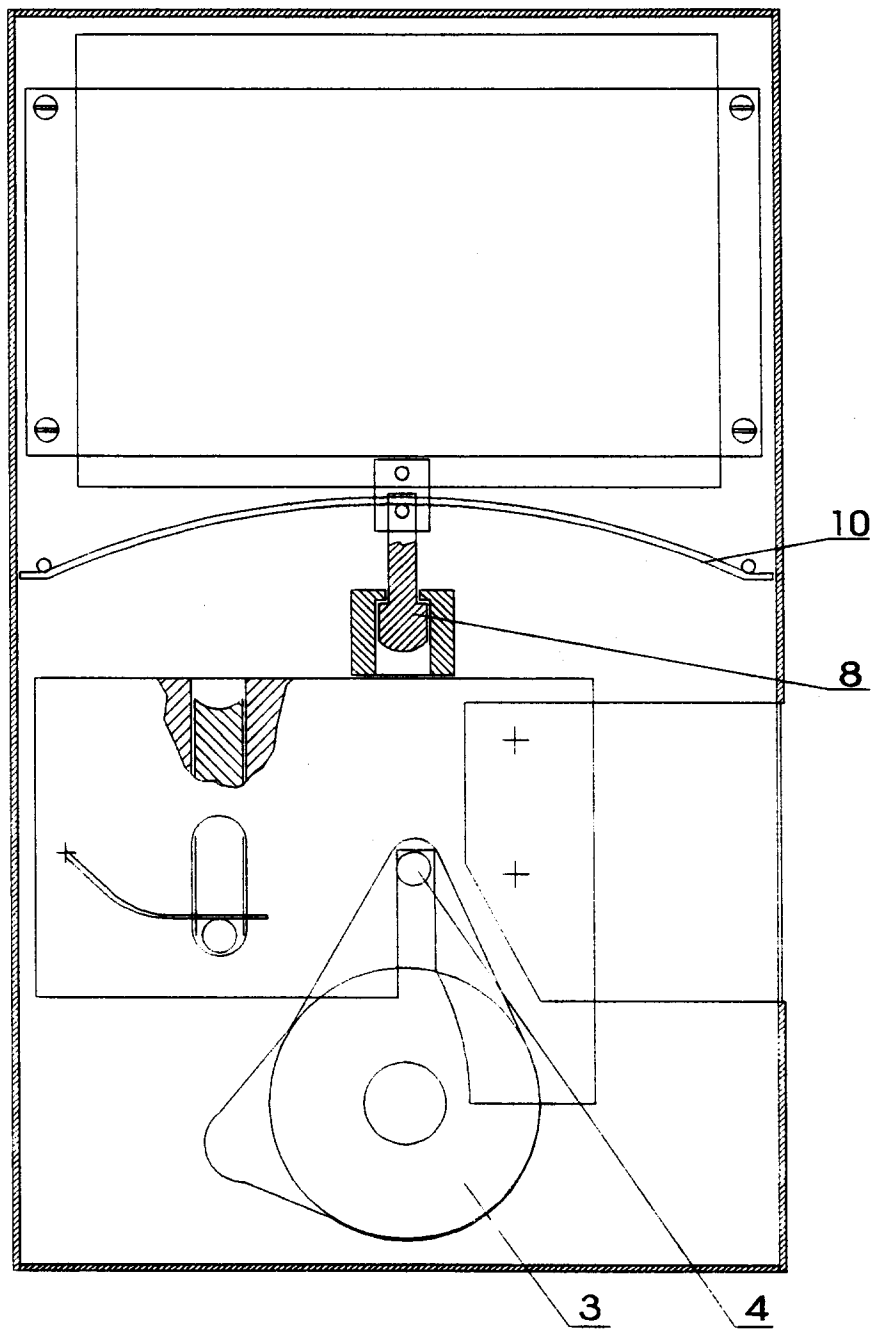


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/RU 94/00117

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl.5 E05B 47/00

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)

Int.Cl.5 E05B 15/10, 47/00 - 47/08

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SU,A3,1505448 (ELZETT MJUVEK), 30 August 1989 (30.08.89)	1
A	---	
A	SU,A3,1694066 (V.N. FAERMAN), 23 November 1991 (23.11.91)	1
A	---	
A	US,A,4253320 (YMOS-METALLWERKE WOLK & BECKER GMBH & CO) 3 March 1981 (03.03.81)	1
A	---	
A	US,A,5005393 (CHUBB LIPS NEDERLAND BV), 9 April 1991 (09.04.91)	1
A	---	
A	GB,A,2069590 (CAROLA MALKMUS-DORNEMANN), 26 August 1981 (26.08.81)	1

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

14 July 1994 (14.07.94)

Date of mailing of the international search report

06 September 1994 (06.09.94)

Name and mailing address of the ISA/ RU

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