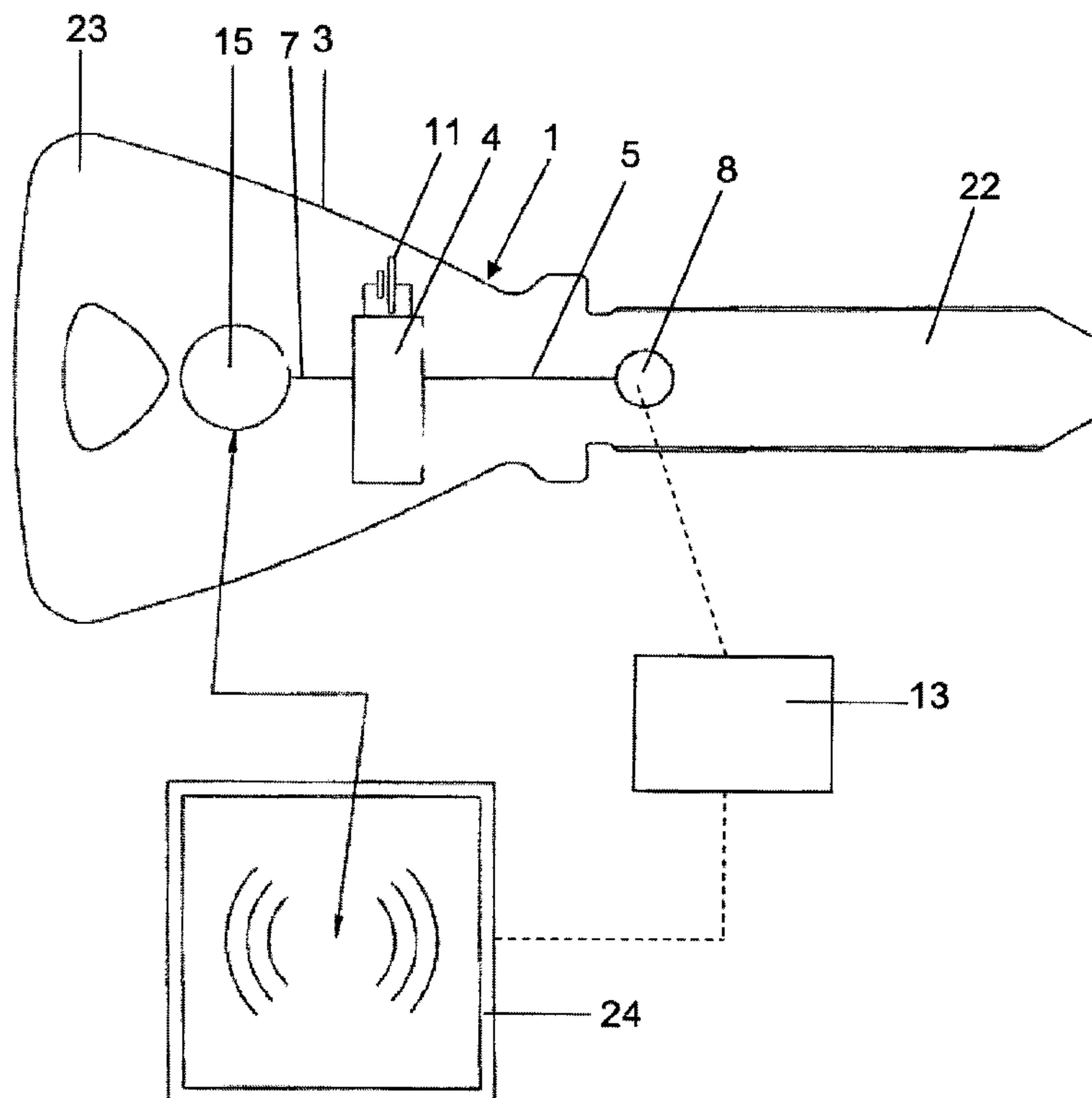




(86) Date de dépôt PCT/PCT Filing Date: 2010/03/01
(87) Date publication PCT/PCT Publication Date: 2010/10/07
(45) Date de délivrance/Issue Date: 2017/12/05
(85) Entrée phase nationale/National Entry: 2011/09/19
(86) N° demande PCT/PCT Application No.: CH 2010/000048
(87) N° publication PCT/PCT Publication No.: 2010/111796
(30) Priorité/Priority: 2009/03/30 (CH500/09)

(51) Cl.Int./Int.Cl. *G07C 9/00* (2006.01)
(72) Inventeurs/Inventors:
SPRENGER, DETLEF, CH;
MUNGER, ANDREAS, CH
(73) Propriétaire/Owner:
ASSA ABLOY (SCHWEIZ) AG, CH
(74) Agent: NORTON ROSE FULBRIGHT CANADA
LLP/S.E.N.C.R.L., S.R.L.

(54) Titre : DISPOSITIF DE FERMETURE MECATRONIQUE
(54) Title: MECHATRONIC LOCKING APPARATUS



(57) Abrégé/Abstract:

The mechatronic locking apparatus comprises a control circuit (4), from which information signals can be transmitted to a control circuit (6) of the lock cylinder (2) using a first communication path (5). A security key (3) has at least one second communication path (7) for storing and/or processing access data. The two communication paths (5, 7) are connected to said control circuit (4) of the security key (3). The first communication path (5) preferably uses an electrical contact in the lock cylinder (2). The second communication path (7) comprises a transponder (8). The first communication path (5) may also be used for power supply purposes.

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES
PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG(19) Weltorganisation für geistiges Eigentum
Internationales Büro(43) Internationales Veröffentlichungsdatum
7. Oktober 2010 (07.10.2010)(10) Internationale Veröffentlichungsnummer
WO 2010/111796 A1(51) Internationale Patentklassifikation:
G07C 9/00 (2006.01)

(21) Internationales Aktenzeichen: PCT/CH2010/000048

(22) Internationales Anmeldedatum:
1. März 2010 (01.03.2010)

(25) Einreichungssprache: Deutsch

(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
500/09 30. März 2009 (30.03.2009) CH(71) Anmelder (für alle Bestimmungsstaaten mit Ausnahme
von US): **KESO AG** [CH/CH]; Untere Schwandenstrasse
22, CH-8805 Richterswil (CH).

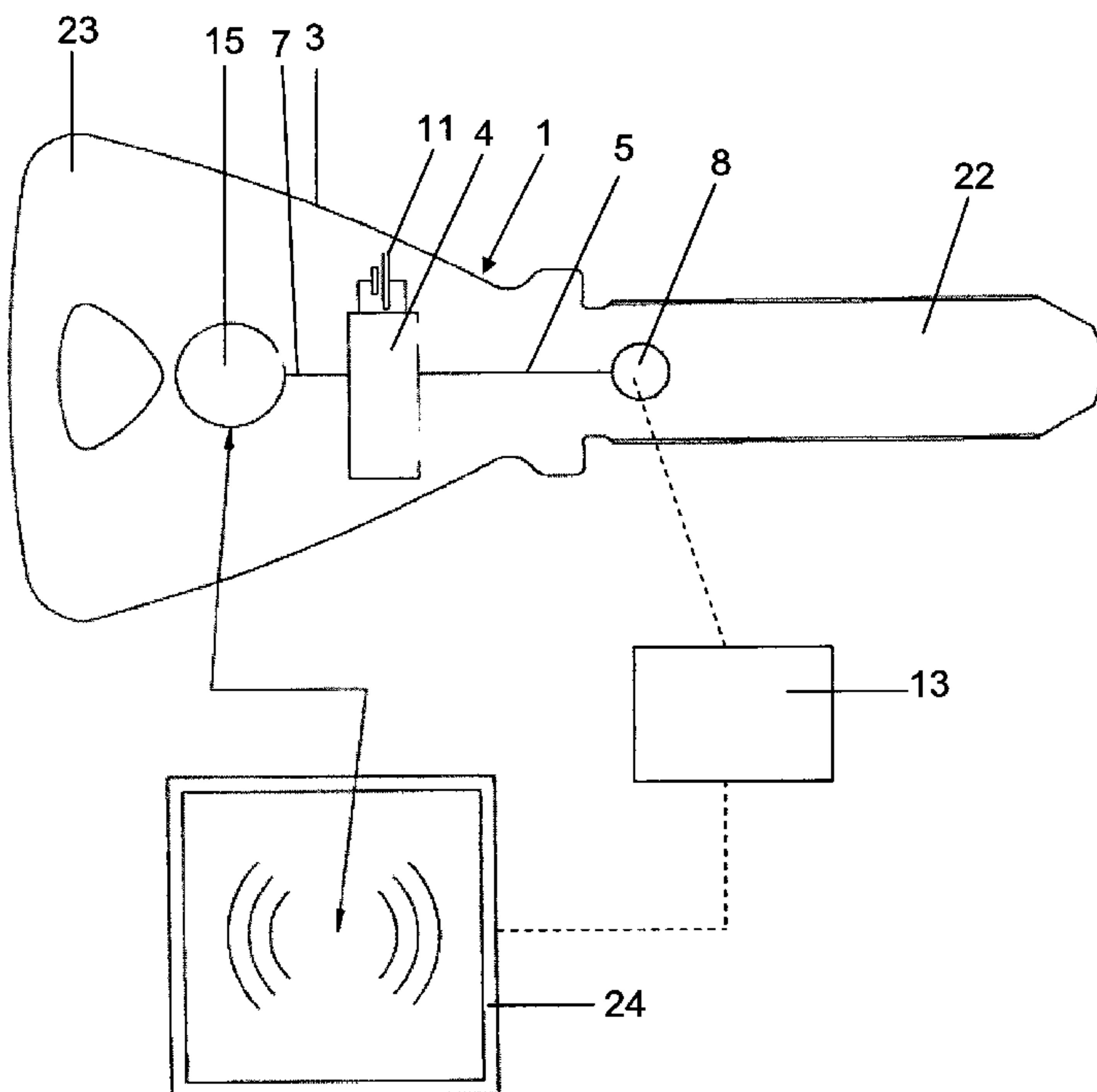
(72) Erfinder; und

(75) Erfinder/Anmelder (nur für US): **SPRENGER, Detlef**
[DE/CH]; Stockbergstrasse 3, CH-8854 Siebnen (CH).
MÜNGER, Andreas [CH/CH]; Blumenaustrasse 34,
CH-8645 Jona (CH).(74) Anwalt: **GRONER, Manfred**; Isler & Pedrazzini AG,
Gotthardstrasse 53, Postfach 1772, CH-8027 Zürich
(CH).(81) Bestimmungsstaaten (soweit nicht anders angegeben, für
jede verfügbare nationale Schutzrechtsart): AE, AG, AL,
AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM,
GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN,
KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA,
MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG,
NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC,
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.(84) Bestimmungsstaaten (soweit nicht anders angegeben, für
jede verfügbare regionale Schutzrechtsart): ARIPO (BW,
GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,
ZM, ZW), eurasisches (AM, AZ, BY, KG, KZ, MD, RU,
TJ, TM), europäisches (AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT,
LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI,

[Fortsetzung auf der nächsten Seite]

(54) Title: MECHATRONIC LOCKING APPARATUS

(54) Bezeichnung : MECHATRONISCHE SCHLIESSVORRICHTUNG

**FIG. 1**(57) Abstract: The mechatronic locking apparatus
comprises a control circuit (4), from which informati-
on signals can be transmitted to a control circuit (6)
of the lock cylinder (2) using a first communication
path (5). A security key (3) has at least one second
communication path (7) for storing and/or processing
access data. The two communication paths (5, 7) are
connected to said control circuit (4) of the security
key (3). The first communication path (5) preferably
uses an electrical contact in the lock cylinder (2). The
second communication path (7) comprises a transpon-
der (8). The first communication path (5) may also be
used for power supply purposes.(57) Zusammenfassung: Die mechatronische
Schliessvorrichtung besitzt eine Steuerschaltung (4),
aus welcher über einen ersten Kommunikationsweg
(5) Informationssignale an eine Steuerschaltung (6)
des Schliesszylinders (2) übertragbar sind. Ein Si-
cherheitsschlüssel (3) weist zur Speicherung und/oder
Verarbeitung von Zutrittsdaten wenigstens einen
zweiten Kommunikationsweg (7) auf. Die beiden
Kommunikationswege (5, 7) sind mit der genannten
Steuerschaltung (4) des Sicherheitsschlüssels (3) ver-
bunden. Der erste Kommunikationsweg (5) erfolgt
vorzugsweise über einen elektrischen Kontakt im
Schliesszylinder (2). Der zweite Kommunikationsweg
(7) weist einen Transponder (8) auf. Über den ersten
Kommunikationsweg (5) ist auch eine Stromversor-
gung möglich.

WO 2010/111796 A1

SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG). **Veröffentlicht:**
— *mit internationalem Recherchenbericht (Artikel 21 Absatz 3)*

MECHATRONIC LOCKING APPARATUS

The invention relates to a mechatronic locking apparatus having a lock cylinder and an associated security key which has a control circuit from which information signals can be transmitted to a control circuit of the lock cylinder via a first communication path.

10 A mechatronic locking apparatus of this kind has been disclosed, for example, in WO 2007/073608 by the same applicant. Information signals can be transmitted to the control circuit of the rotary lock cylinder by means of the control circuit. Signals are transmitted
15 via an electrical contact element which is arranged in the keyway of the rotary lock cylinder. One significant advantage of a locking apparatus of this kind is that increased security is possible by virtue of an electronically secured user identification means. A
20 user identification means of this kind can result in it being possible to operate the rotor using the inserted key only by providing a predetermined item of electronic information. The rotor is unlocked, for example, by means of an actuator which has a blocking
25 element which can be moved between a blocking position and an unblocked position by a motor.

The rotary lock cylinder of a locking apparatus of this kind can be operated in a "stand-alone" manner or in a
30 networked manner. A networked system having a plurality of mechatronic locking apparatuses is disclosed in WO 2006/056085 by the same applicant. This system has a computer having software for monitoring access authorizations and having at least one database
35 containing data relating to the access authorizations. The data generally comprises the names of the authorized users, a list of the locking apparatuses to which these users have access, and information, for

example, for time windows within which these users are authorized to gain access. Systems of this kind make it possible for mutations to be made from a control center in a simple and quick manner via a network.

5

US 2005/0077995 discloses a locking apparatus having a key with which user-specific data is transmitted to the lock cylinder when the key is inserted into the lock cylinder. The user-specific data is that from a fingerprint sensor which is arranged on the grip of the key. The lock cylinder can be operated when the user-specific data has been identified as authorized and, in addition, the rotor is mechanically unblocked by the key. The user-specific data is transmitted from the key to the lock cylinder by means of an electrical contact in the lock cylinder or in a contactless manner. A locking apparatus in which the locking security is likewise intended to be increased by means of data from a fingerprint sensor has also been disclosed by WO 2005/013181. The locking apparatus according to EP-A-0743411 has also disclosed that an electronic code generator is arranged in the key and an electronic code evaluation means is arranged in the cylinder housing. The code is transmitted using a transponder and a transponder reading device. WO 2009/036585 discloses a lock device which has an electronic module for receiving data from an identification unit and an electric motor for operating the blocking and/or coupling device. In the event of operation, the electric motor acts as a generator in order to charge the energy storage means for the electronic module.

The invention is based on the object of providing a locking apparatus of said type which is even more suitable for such systems.

In the case of a locking apparatus of this generic type, the object is achieved in that the security key

has at least a second communication path for the purpose of storing and/or processing access data. In the locking apparatus according to the invention, the security key has at least two communication paths. The
5 first communication path is created by means of an electrical contact in the lock cylinder. A significant advantage of the apparatus according to the invention is that it is also possible to supply power via this first communication path. This can be performed, in
10 particular, by means of a battery which is arranged in the security key. However, the battery can, in principle, also be arranged in the lock cylinder. The two communication paths are each connected to the control circuit of the security key. The locking
15 apparatus according to the invention can also be an electronically secured lock cylinder which does not have any mechanical security means, that is to say does not contain bolts and pins as is otherwise customary.

20 The second communication path is RFID-based and allows data to be read and input into the control circuit of the security cylinder in a contactless manner by means of a read device or write device. Therefore, in the case of the locking apparatus according to the
25 invention, communication is possible via two paths. The data in the control circuit which is arranged on the security key can be used via the two communication paths and therefore both via RFID and also via the electrical contact in the lock cylinder. Irrespective
30 of the communication path, the access data can be processed via a circuit. This is also true of other data. This data can be written, read and changed both via the first and via the second communication path, and also centrally stored and managed.

35

According to a development of the invention, provision is made for the control circuit in the lock cylinder to be performed by means of bidirectional communication.

Power is also supplied via the same electrical connection. In addition, provision is made for the control circuit of the lock cylinder to communicate with the control circuit of the security key by means of a modulated current.

5

According to a development of the invention, provision is made for the data to be transmitted in encrypted form via the first and via the second communication path, and also to be stored in encrypted form. Provision is also made, according to one
10 development of the invention, for the security key to contain an identification and/or authentication mechanism. The data for identification and authentication are preferably transmitted and stored in encrypted form.

15 According to one development of the invention, provision is made for the control circuit which is arranged in the key to have a clock which can be read from and changed via the two communication paths. The authorization for manipulation is therefore possible by means of data management via the two
20 communication paths.

In accordance with one embodiment of the invention, there is provided a mechatronic locking apparatus comprising a lock cylinder and an associated security key which has a first
25 control circuit from which information signals can be transmitted to a second control circuit of the lock cylinder via a first communication path, wherein the security key has at least a second communication path for the purpose of at least one of storing and processing access data, wherein the first and
30 second communication paths are connected to said first control circuit of the security key, wherein access data can be written, read and changed both via the first and via the second communication path, wherein the first communication path on the security key has electrical contact means which are in contact
35 with electrical contact means of the lock cylinder, for the purpose of signal transmission, when the key is inserted into a

-4a-

keyway in the lock cylinder, and wherein the second communication path has a transponder.

Further advantageous features can be found in the dependent
5 patent claims, the following description and the drawings.

An exemplary embodiment of the invention will be explained in greater detail below with reference to the drawings, in which:

10 fig. 1 schematically shows a locking apparatus according to the invention,

fig. 2 shows a view of the front face of a lock cylinder of the locking apparatus according to the invention, and

15

fig. 3 shows a circuit diagram of the locking apparatus according to the invention.

- 5 The locking apparatus 1 according to the invention has, according to figure 1, a security key 3 which has a shank 22 and a grip 23. The security key 3 is used to operate the lock cylinder 2 which is shown in figure 2. Said lock cylinder has a rotor 25 and a stator 26 for
10 enabling the rotor 25 to rotate, for which purpose the shank 22 of the key is inserted into a keyway 10 in the rotor. In this case, tumblers (not shown here) are arranged in a manner which is known per se.
- 15 A control circuit 4 which is fed by an energy source 11, in particular a battery, is arranged in the grip 23 of the key 3. The control circuit 4 and the energy source 11 are arranged, for example, in a recess (not shown here) in the grip 23 and covered by a cover or
20 the like (not shown here). The control circuit 4 is used, in particular, for storing and processing access data. This access data can be written to the control circuit 4, read from said control circuit and changed by means of a control center 13, for example by means
25 of a laptop. This data can be stored and managed in the control center 13. Communication for these processes is possible via two paths. Said paths will be described in greater detail below.
- 30 The first path, via which the control center 13 can communicate with the control circuit 4, has a first communication path 5 which connects the control circuit 4 to a contact means 8 which is arranged on the security key 3. This contact means 8 is, for example, a
35 contact plate which is arranged on the outside at the rear end of the shank 22. If the shank 22 is inserted into the keyway 10, the contact means 8 is electrically connected to a contact means 9 which, according to

figure 2, is arranged like in the keyway 10. This first communication path 5 is formed by a signal line which connects the control circuit 4 to the contact means 8. Said signal line runs in the key 3. The contact means 9 is connected to a control circuit 6 which, according to figure 2, is arranged in the stator 26. Said control circuit 6 controls, for example, an actuator which is described, for example, in WO 2007/073608. If the shank 22 is inserted into the keyway 10, the control circuit 4 transmits the authorization data to the control circuit 6 via the first communication path 5. This data is checked in the control circuit 6. If authorization is granted, the actuator is accordingly operated.

If the security key is a reversible key, both sides of the key or both sides of the keyway are provided with an electrical contact element.

The second path has a second communication path 7 which connects the control circuit 4 to a transponder 15 which is known per se and which is likewise arranged in the grip 3. This transponder 15 has an antenna 27 (figure 3) which is known per se and which allows contactless communication with a read device 24. The transponder 15 allows RFID-based transmission of data between the circuit 4 and the control center 13 which is connected to the read device 24 for signal transmission. This read device 24 can be used to read data from, input data into and change data in the control circuit. In addition, the data in the control center 13 can be stored and then managed in said control center by means of the read device 24. Therefore, in the locking apparatus according to the invention, data transmission is possible by means of the contacts 8 and 9, and RFID-based data transmission or communication is also possible. As mentioned above, feeding via the first communication path 5 is possible. In addition, energy can be supplied via the antenna 27

of the transponder 15 or via RFID. As shown in figure 3, a power control means 16 which is connected to the energy source 11 and to a voltage converter 12 is provided. This power control means 16 switches at least parts of the circuit 4 on and off in order to keep the energy consumption as low as possible. Many batteries have, on account of their internal resistance, a large voltage drop at current peaks. The voltage converter 12 makes it possible to compensate for a voltage drop in the battery. In order to reduce the quiescent current, the voltage converter 12 is preferably switched off in the inoperative state. When the key 3 is inserted into the lock cylinder 2, the voltage converter 12 is switched on and compensates. The voltage drop which was caused by the current peaks. According to figure 3, the control circuit 4 has a system detector 20 which switches on the respectively required process. The switch-on operation is performed on the basis of the relevant system and therefore selectively via the first communication path 5 or via the second communication path 7. The system detector 20 is accordingly connected to the contact means 9 or to the transponder 15.

The circuit 4 also has encryption means 17 and a clock 14. The clock 14 is protected by the encryption means 17. The clock 14 can be read from and changed both via the first communication path 5 and via the second communication path 7. The authorization for manipulation of the clock 14 is controlled by the data processing means.

The control center 13 is likewise protected by an encryption means 19. Said control center has at least one data storage means 18 and means for data management 21. The control center 13 can, as shown, communicate with the control circuit 4 via the first communication path 5 or via the second communication path 7. In addition, a firmware update can be carried out via the

WO 2010/111796

- 8 -

PCT/CH2010/000048

first communication path 5 and via the second communication path 7.

Communication is performed by means of the second
5 communication path 7 in accordance with the
respectively indicated standards of the transponder
technology used. One or more RFID technologies can be
processed, for example, at frequencies of 13.56 MHz or
125 kHz. The control circuit 4 can be directly
10 connected to the RFID antenna 27 and communicate via
said RFID antenna.

Provision is made for the storage and processing of the
following data and characteristics in particular:

15

uniqueness numbers
access authorizations
time zones
time windows

20

block lists/withdrawal of authorization
status information
history information
segmentation of data for third party users
grouping of users

LIST OF REFERENCE SYMBOLS

	1	Locking apparatus
	2	Lock cylinder
5	3	Security key
	4	Control circuit
	5	First communication path
	6	Control circuit
	7	Second communication path
10	8	Contact means
	9	Contact means
	10	Keyway
	11	Energy source
	12	Voltage converter
15	13	Control center
	14	Clock
	15	Transponder
	16	Power control means
	17	Encryption means
20	18	Data storage means
	19	Encryption means
	20	System detector
	21	Data processing means
	22	Shank
25	23	Grip
	24	Read device
	25	Rotor
	26	Stator
	27	Antenna
30		(RFID antenna)

- 10 -

CLAIMS:

1. A mechatronic locking apparatus comprising a lock cylinder and an associated security key which has a first control circuit from which information signals can be transmitted to a second control circuit of the lock cylinder via a first communication path, wherein the security key has at least a second communication path for the purpose of at least one of storing and processing access data, wherein the first and second communication paths are connected to said first control circuit of the security key,
- wherein access data can be written, read and changed both via the first and via the second communication path,
- wherein the first communication path on the security key has electrical contact means which are in contact with electrical contact means of the lock cylinder, for the purpose of signal transmission, when the key is inserted into a keyway in the lock cylinder, and
- wherein the second communication path has a transponder.
2. The locking apparatus as claimed in claim 1, wherein said contact means are provided both for signal transmission and for feeding the second control circuit of the lock cylinder by means of an energy source.
3. The locking apparatus as claimed in claim 2, wherein the energy source is arranged on the security key or in the lock cylinder.
4. The locking apparatus as claimed in claim 3, wherein the first control circuit on the security key has a voltage converter.

- 11 -

5. The locking apparatus as claimed in claim 4, wherein the voltage converter is switched off in an inoperative state and is switched on when the security key is inserted into the lock cylinder.

5

6. The locking apparatus as claimed in claim 2, wherein the first control circuit which is arranged on the security key communicates with the second control circuit of the lock cylinder in a bidirectional manner by means of two electrical conductors.

10

7. The locking apparatus as claimed in any one of claims 1 to 6, wherein the locking apparatus is connected to a control center in which the access data is stored and can be managed, and in that the control center is connected to the first control circuit which is arranged on the security key via the two said communication paths.

15

8. The locking apparatus as claimed in any one of claims 1 to 7, wherein the first control circuit on the security key in the second communication path is connected to an RFID antenna directly via an interface connection.

20

25

9. The locking apparatus as claimed in any one of claims 1 to 8, wherein the first control circuit on the security key has a clock which can be read from and changed via the two communication paths.

30

10. The locking apparatus as claimed in claim 9, wherein at least one time window is determined by means of the clock.

11. The locking apparatus as claimed in claim 9, wherein at least one time zone is determined by means of the clock.

35

- 12 -

12. The locking apparatus as claimed in claim 9, wherein at least one time window and at least one time zone are determined by means of the clock.

5 13. The locking apparatus as claimed in any one of claims 1 to 12, wherein the first control circuit on the security key has data for at least one of the following:

10 uniqueness number;
access authorization;
time zones;
time windows;
block lists;
withdrawal of authorization;
15 status information;
history information;
segmentation for data for third party users; and
grouping of users.

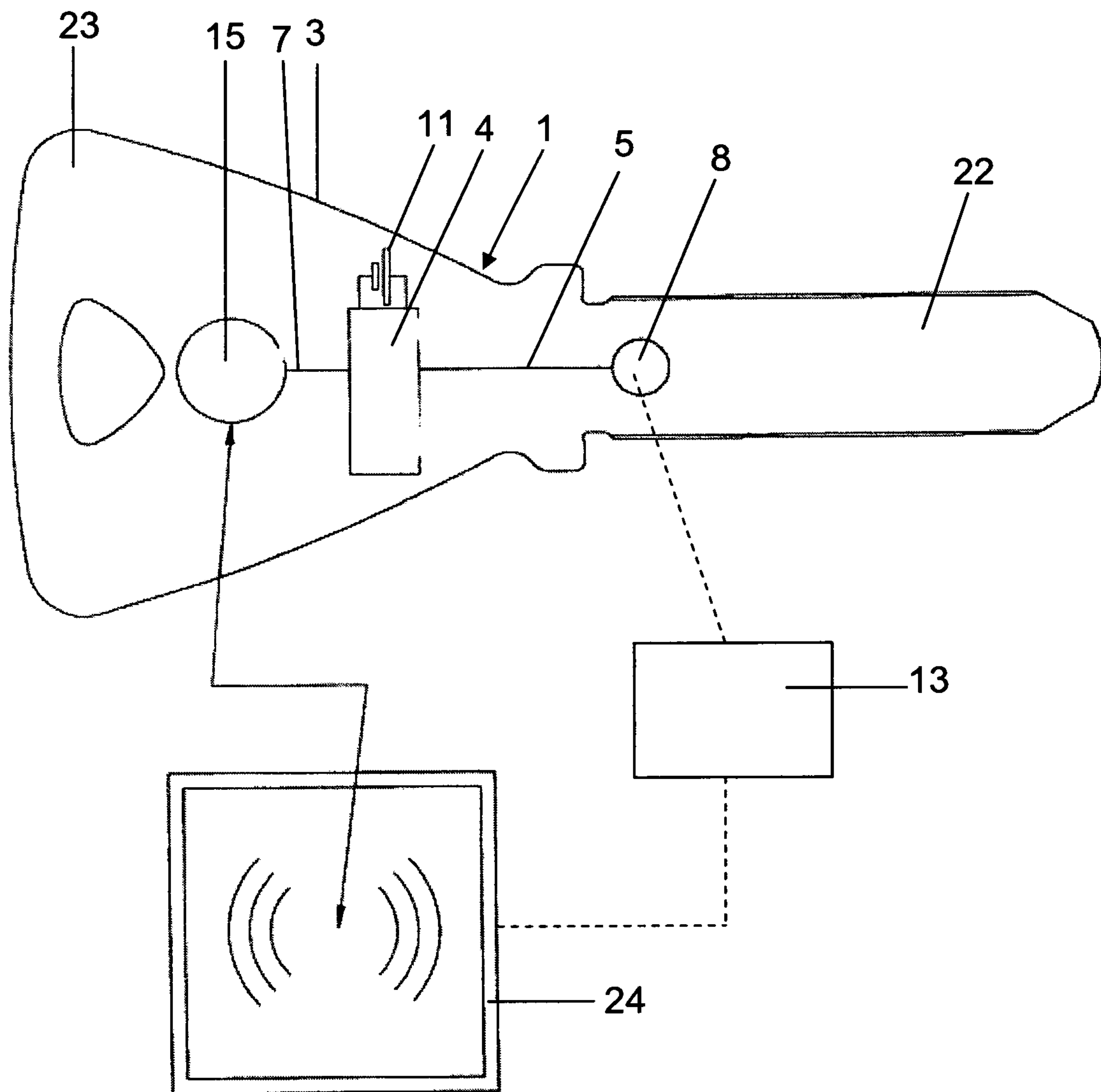


FIG. 1

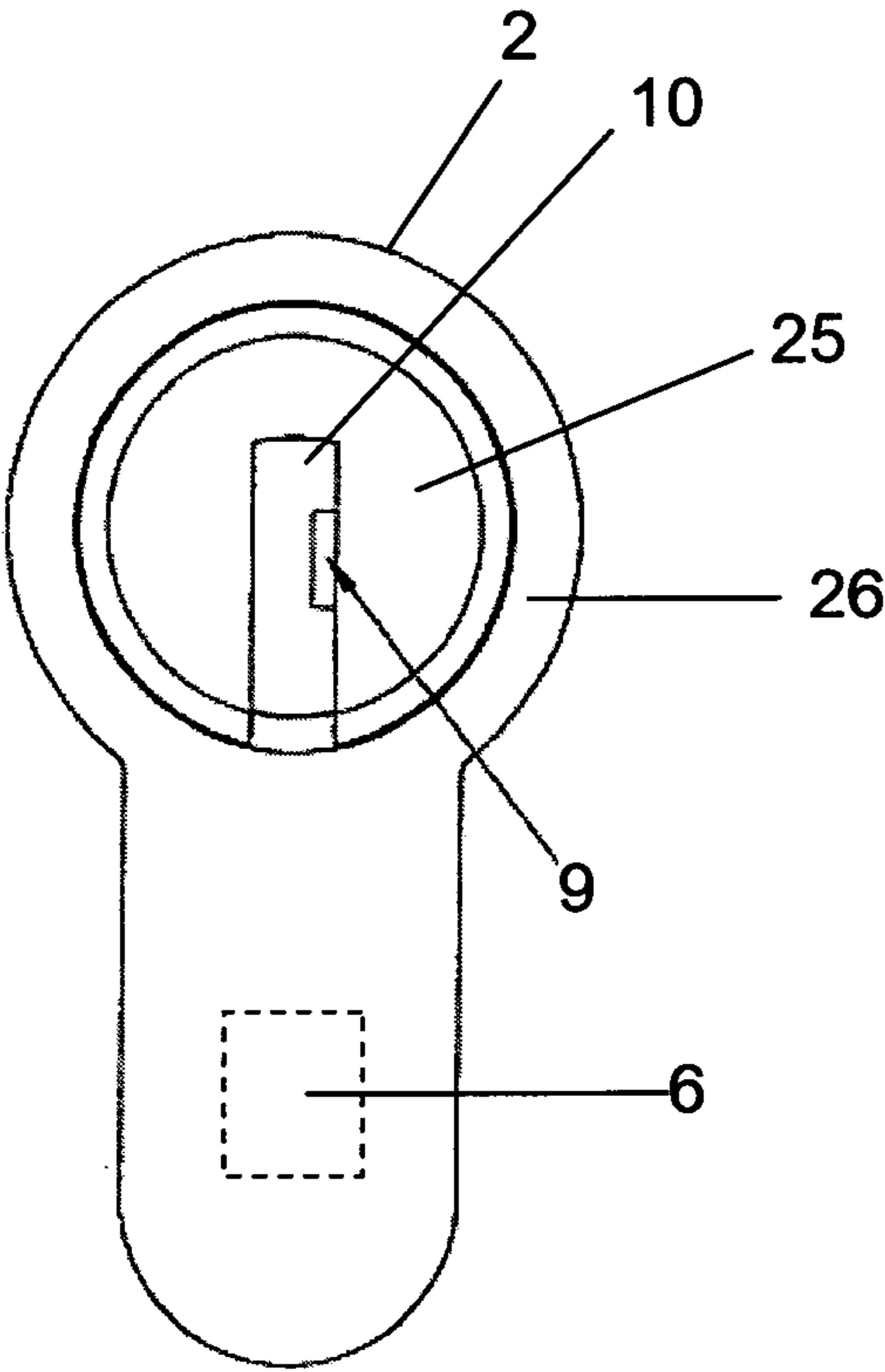


FIG. 2

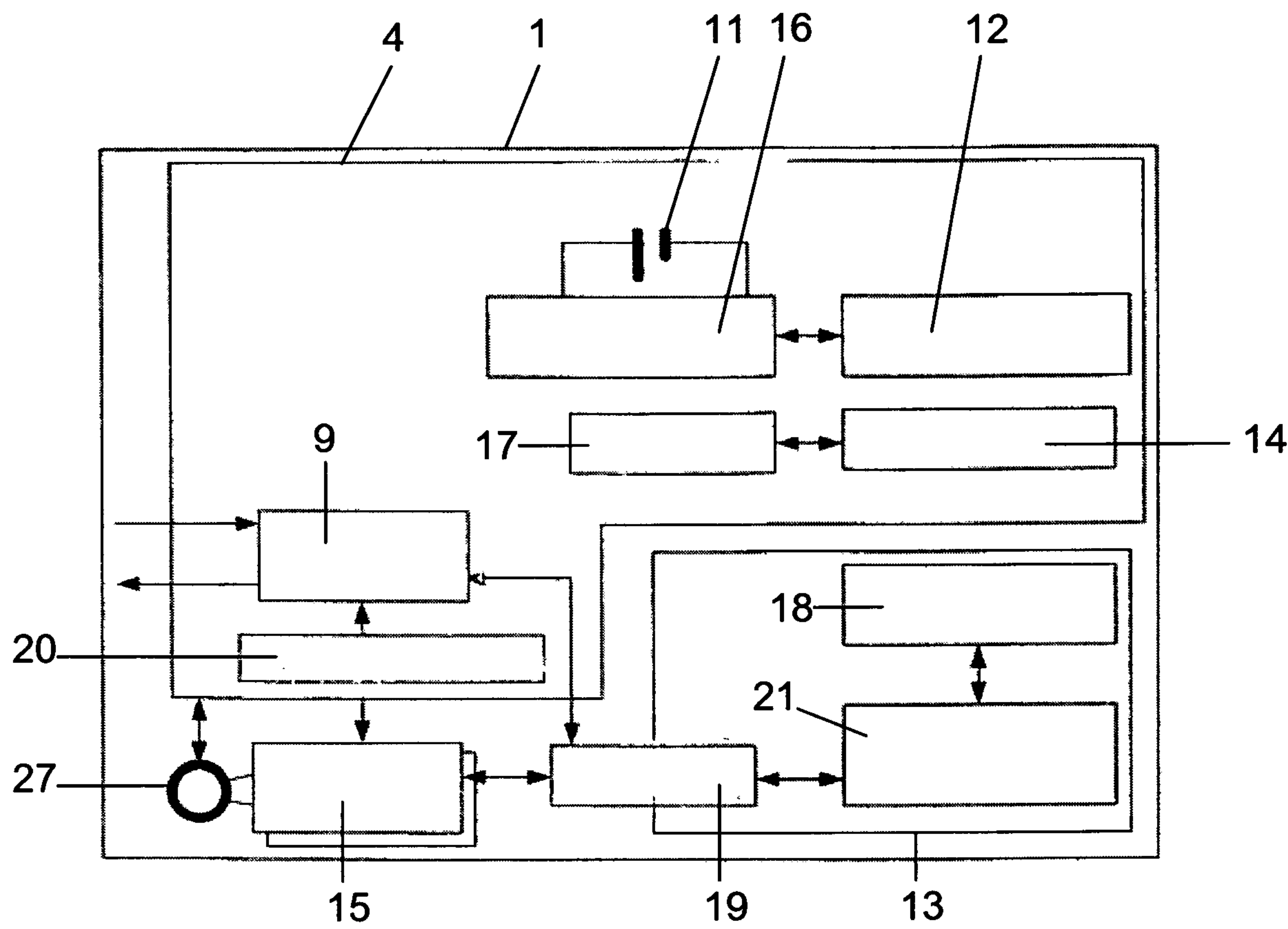


FIG. 3

