(12) UK Patent Application (19) GB (11) 2 236 797 (13) A

(43) Date of A publication 17.04.1991

(21) Application No 9018610.7

(22) Date of filing 24.08.1990

(30) Priority data
(31) 893527 (32) 01.09.1989 (33) NO

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(51) INT CL[5]
E05B 49/00

(52) UK CL (Edition K)
E2A ALV A420
U1S S1714

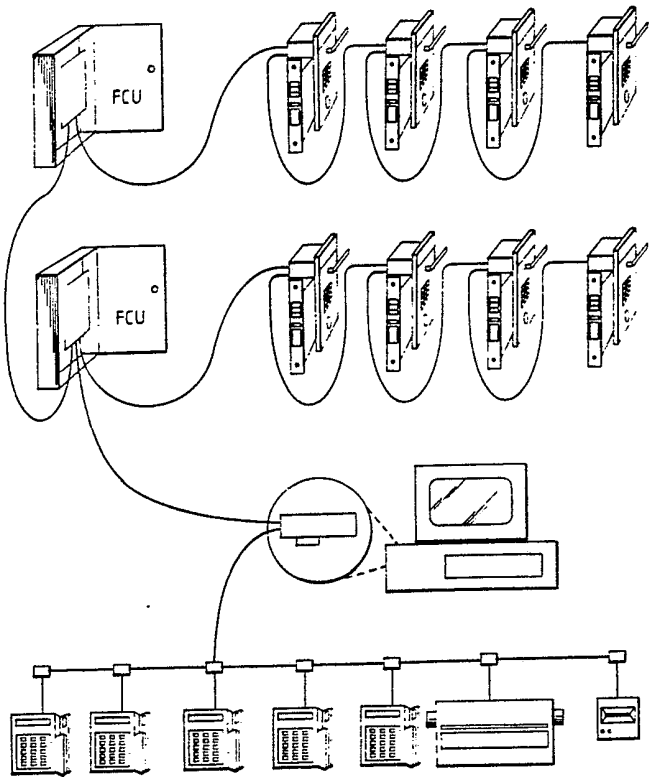
(56) Documents cited
GB 2069582 A **GB 1597983 A** **US 4760393 A**
US 4727369 A **US 4721954 A**

(58) Field of search
UK CL (Edition K) **E2A ALV**
INT CL[5] **E05B**

(54) Electronic lock system

(57) Electronic controlled lock system, comprising a lock which via cable communicates with a central unit, characterized in that each lock comprises an independent unit having its own power supply, and that the unit is such adapted that it in addition to enabling exchange of communication with the central station for the control of the lock, also can control the lock without communication with the central unit.

Fig. 1. LOCK SYSTEM LAYOUT



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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Fig. 1. LOCK SYSTEM LAYOUT

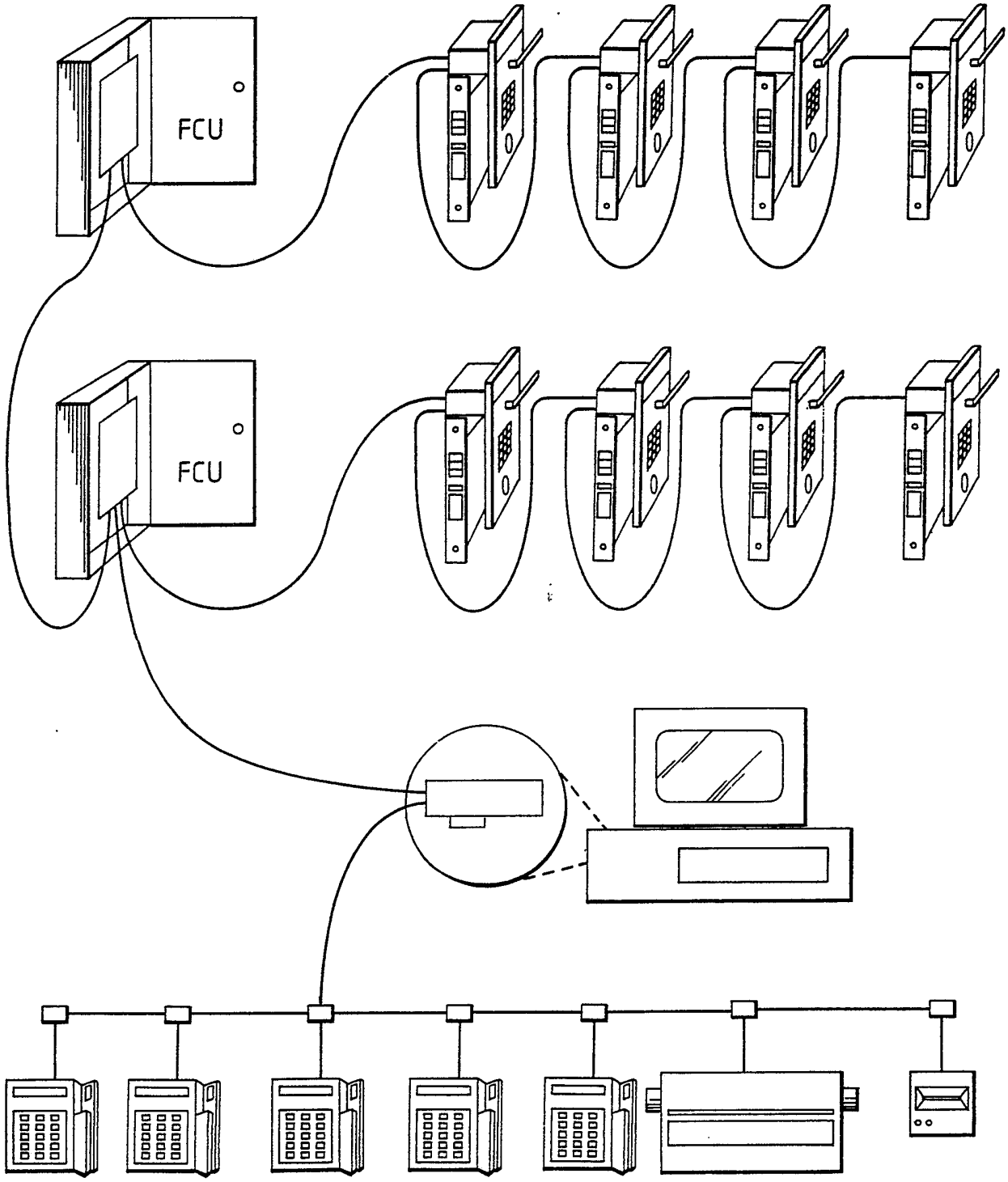


Fig. 2.

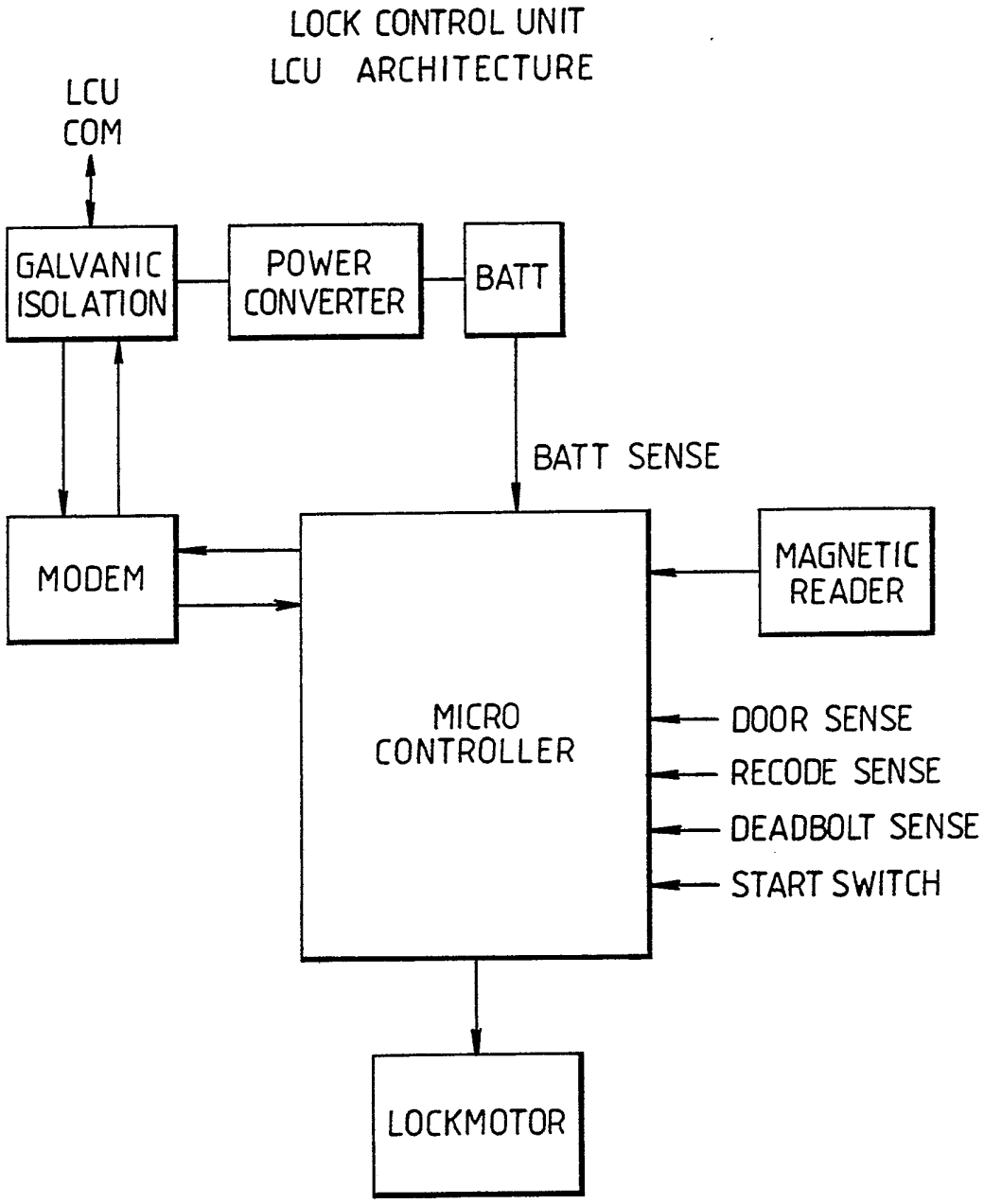
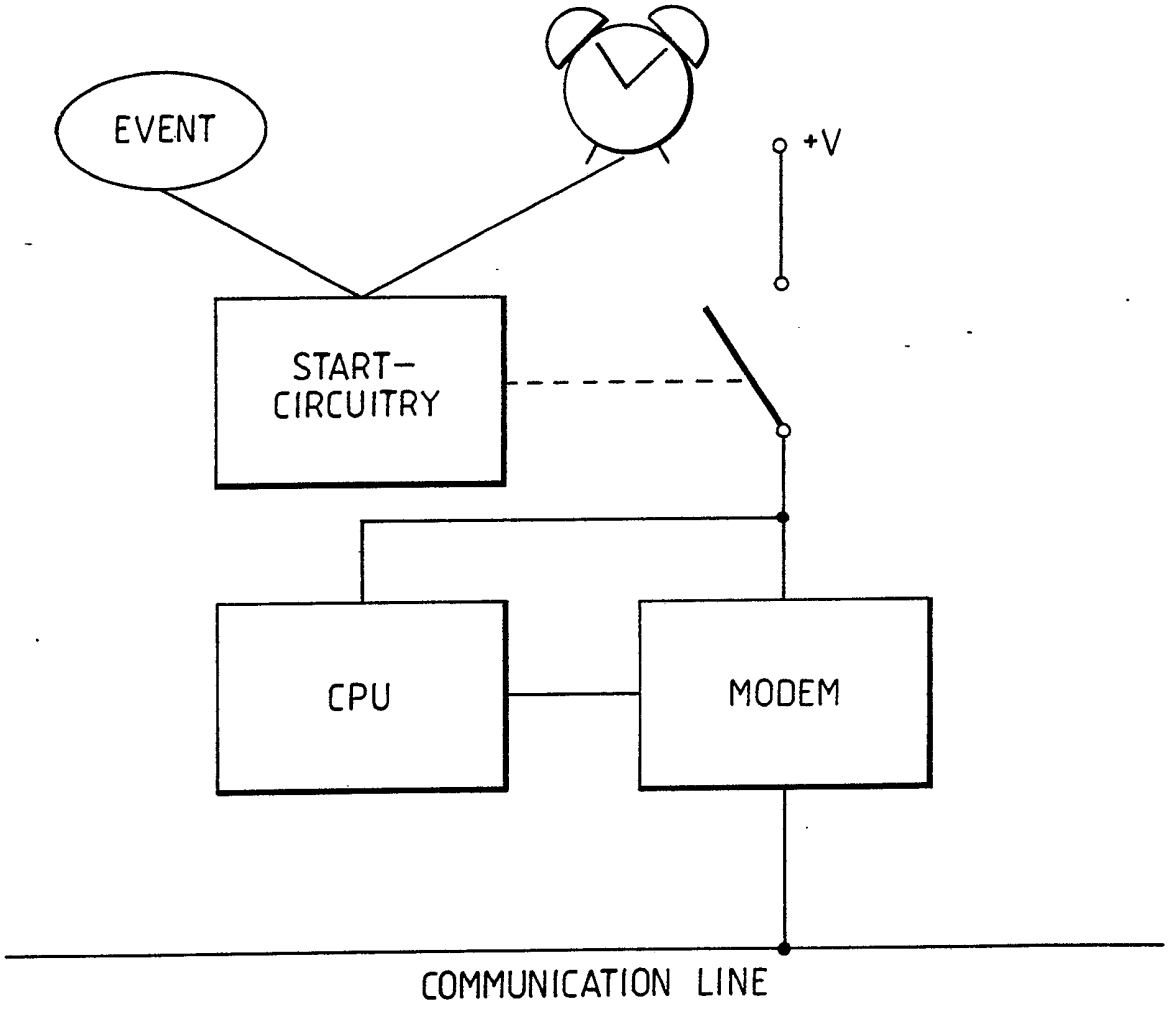

LOCK CONTROL UNIT
LCU ARCHITECTURE
LCU
COM
GALVANIC
ISOLATION
POWER
CONVERTER
BATT
BATT SENSE
MODEM
MAGNETIC
READER
MICRO
CONTROLLER
DOOR SENSE
RECODE SENSE
DEADBOLT SENSE
START SWITCH
LOCKMOTOR

Fig. 3.

WAKE UP AND LISTEN



ELECTRONIC CONTROLLED LOCK SYSTEM

Field of the invention

The present invention relates to an electronic controlled lock system, comprising at least one lock which via cable communicates with a central unit.

In other words, the invention relates to a lock system wherein a limited number of people are allowed access to rooms during a limited time interval, for example in hotels or similar. However, the invention is not limited to this application, but could also be used for controlling access to other rooms in offices and industry, i.e. an access control system. The locks of this system is preferably operated by means of keys being shaped as cards having magnetic code, or punched cards or similar.

Prior art

Such systems are previously known, both as wire-less systems (off-line) and as systems connected with wires (on-line). In both cases the systems may communicate with a central unit either directly or by means of key means (cards) which are issued by the central unit and are carried to the locks. See for example EP 0 122 244 B1 and US 3 821 704.

Prior art lock systems of this type are, in case they are of the off-line type, based on a solution wherein each lock unit at the associated door uses batteries as a power source, and is therefore constructed for a smallest possible power consumption. However, the on-line systems are mostly based on power supply through the same cable, i.e. the communication cable, and will therefore have a larger versatility as regards power consumption.

Disclosure of the invention

The specific and novel in the present structure is a lock system which is a flexible system which can be off-line or

on-line system as desired. Each lock unit has its own supply of energy by their own battery packs. In traditional off-line systems the lock units are so adapted that they, in order to save energy, remain in a normally dormant condition and is only woken up by inserting a card or a key in the lock. In traditional on-line systems the lock is always in an alert condition, since it always must be prepared to receive instructions from the central. Consequently, on-line locks have normally a higher energy consumption and is therefore connected to powerful energy sources, to household networks or similar.

The present lock can be constructed with a wake-up system "Line-wake-up". This means that the lock unit is normally dormant as an off-line lock and therefore energy conserving. It will therefore be independent of external energy sources. When the lock unit is to receive instructions, a strong impulse or pulse of a specific character is transmitted via the communication channel (along a line or wireless). This pulse "wakes up" the lock and switches it to a listening position. The transmitter can now transmit its message to the lock. After having received the message the lock is automatically switched back to a "dormant position". Consequently, the current consumption will not be higher than in a traditional off-line lock. The wake-up and listen system will thus allow the battery operated units to be connected to a communication network. Since the units are listening actively only when messages are transmitted, no energy is used for listening to a passive line. In the case several locks at a floor or in any group should have a common communication line, i.e. a so-called "loop" or connection, the wake-up pulse will wake-up all the locks connected to the loop, and each lock will listen for its address and thereafter fall to sleep if the transmitted address is not recognized. The wake-up detector is constructed such that it discriminates between wake-up signals and line noise, for thereby eliminating unnecessary waking up and current consumption.

The lock may also have a "periodic wake-up and listen" property. This will enable the lock to be in a normally dormant and energy saving condition, which is periodically interrupted by a "timer" included in the lock. By the periodic waking up the lock will listen for its address at the communication input. If the address is not received, the lock will regain its current saving sleep.

The lock is also provided with "backup cards". In conventional on-line locks of today it is impossible to communicate with locks if the communication line is broken, and the locks will thereby be made inoperable in the sense that no new keys can be activated or old keys cancelled. However, in the present system there is in each lock predesignated and prestored a number of key codes, and corresponding keys are stored as reserve supply. During normal conditions these keys will not be able to operate the keys, but if the communication line to the locks is broken, the locks will respond to the error and start a life as off-line locks. In this off-line condition the reserve supply cards or keys will, as time goes by, be enabled to operate the locks, but only one at a time. When inserting a previously not used backup key, the key used so fare will be cancelled and made invalid, and the inserted new key will be the valid key.

This key remains valid until another backup key is used, a new guest is checked in, or, if the communication line is brought in order, then a new key is issued from the communication central and the system reverts to a normal on-line system.

A possible error in the communication network of the present on-line system will thereby not make the normal hotel function impossible. The room is just supplied with another set of keys.

The lock can also be operated by a "Command card". With this

card and possibly a separate authorization code a lock in the system can for a period be disconnected from the network, for thereby being operated locally as an off-line lock until it is given the command of reverting to the network system. The command can also be given for switching off the system for a predetermined time interval. In a hotel, one room which for example is being maintained, cleaned, or similar, can have its lock taken out of the system, such that the lock is always open or has to be operated with a key in the traditional manner. (In accordance with several standard regulations hotel locks have always to be locked when the door is closed, i.e. by latches.) This function is of great advantages in hotels, but also makes the system more versatile for use outside hotels, for example in industry, business buildings and similar.

The locks may also be provided with a "Bellboy option", luggage service facilities. In current known systems this will function so that the bellboy when bringing the luggage to a new guest's room, either brings with him a general main key which opens all rooms, or he must use the guest's own key to lock up the luggage. With the present new system all the bellboy keys (cards) allotted to the section into which the guest is checked, will automatically be dedicated to the current door. The key can be used either until the lock is recoded, for a certain time interval after the first use of the key, or until the guest has used his own key. The bellboy is thereby given the same freedom and flexibility as if he had a main key, but without a corresponding security risk.

Integrated in the lock system there are also other improvements in relation to existing solutions, so as to render the present system flexible and appropriate for use also outside hotels, namely as a more conventional access control system.

In other words, the invention provides an electronic controlled lock system having at least one lock and a central

unit, wherein each lock is an independent battery driven unit, and wherein the communication between lock and central unit takes place by cable, and wherein the locks are operable also without this communication line.

Brief description of the drawings

In the enclosed drawings there are illustrated embodiments of the invention.

Figure 1 illustrates diagrammatically a plurality of lock units connected in groups together with a communication network.

Figure 2 is a block diagram of an embodiment of a lock unit.

Figure 3 is a block diagram of an embodiment of a lock unit wake-up system.

Detailed description of embodiments

An embodiment of the present invention is illustrated in Figures 1, 2 and 3. Figure 1 depicts the lock units interconnected in groups with a communication network. Each group is connected to a group control unit which can serve for example one floor. The system is organized in groups for each floor, inter alia to facilitate the communication if wire-less communication is contemplated, for example radio-waves, infrared light or similar. The group controller also serves as a signal amplifier.

The group controller is in turn connected to a central controller and key issuing device which, when applied in a hotel, most appropriately can be connected to a series of key issuing terminals, printers, or other control equipment.

Figure 2 illustrates a block diagram of the electronics of the lock unit, with associated sensors for checking whether the door is closed, whether it is open, whether the lock is in a bolted or unlocked position, etc.

Figure 3 illustrates a block diagram of the wake-up system of the lock unit, wherein a special microprocessor is constructed to be able to, in its dormant position, to receive a special pulse for thereby trigging the receiver of the lock to listen for its address.

Besides, it can be said that the invention comprises the following features, namely in an electronic controlled lock system, comprising at least one lock which via cable communicates with a central unit,

- that each lock comprises an independent unit having its own power supply, and that the unit is such adapted that it in addition to enabeling exchange of communication with the central station for the control of the lock, also can control the lock without communication with the central unit.

- that each independent unit in the individual lock is a battery driven unit.

- that the unit is adapted to normally being in a passive mode having no or a very small energy consumption, and to be able to receive a trigger pulse by wire-less communication or via the communication cable, and to return to passive mode after received message.

- that the unit comprises a first detector discriminating between trigger signal and noise.

- that each unit lock comprises means for recognizing its own address code, especially in connection with series connected communication cable for a plurality of locks.

- that each unit comprises a timer means which at certain intervals shifts the unit from a passive to an active mode, for thereby listening in the active mode for actual communication messages or commands.

- that each unit comprises a second detector which detects whether the communication line is in order or not, and which upon fault on the electronic lock will activate the lock as an "off-line" lock.

- that when the lock is in its "off-line" mode, the

unit will permit the use of a spare key means, for example a coded key card, for example only one spare key means at a time, whereby a new consecutive spare key means cancels the code of the previously used key means.

- that the unit is so adapted that after use as an "off-line" lock it will only accept key means which are coded into the lock from the central unit, possibly accept a spare key means:

a) until the lock is recoded,

b) for a certain time interval after the first use of the spare key means,

c) or until a newly issued key means has been used for the first time.

Besides, reference is made to the introductory part of the description and the enclosed patent claims.

Patent claims

1. Electronic controlled lock system, comprising a lock which via cable communicates with a central unit, characterized in that each lock comprises an independent unit having its own power supply, and that the unit is such adapted that it in addition to enabeling exchange of communication with the central station for the control of the lock, also can control the lock without communication with the central unit.

2. Locking system as claimed in claim 1, characterized in that each independent unit in the individual lock is a battery driven unit.

3. Locking system as claimed in claim 1 or 2, characterized in that the unit is adapted to normally being in a passive mode having no or a very small energy consumption, and to be able to receive a trigger pulse by wire-less communication or via the communication cable, and to return to passive mode after received message.

4. Locking system as claimed in claim 1-3, characterized in that the unit comprises a first detector discriminating between trigger signal and noise.

5. Locking system as claimed in claim 1-4, characterized in that each unit lock comprises means for recognizing its own address code, especially in connection with series connected communication cable for a plurality of locks.

6. Locking system as claimed in claim 1-5, characterized in that each unit comprises a timer means which at certain intervals shifts the unit from

a passive to an active mode, for thereby listening in the active mode for actual communication messages or commands.

7. Locking system as claimed in claim 1-6, c h a r a c t e r i z e d i n that each unit comprises a second detector which detects whether the communication line is in order or not, and which upon fault on the electronic lock will activate the lock as an "off-line" lock.

8. Locking system as claimed in claim 7, c h a r a c t e r i z e d i n that when the lock is in its "off-line" mode, the unit will permit the use of a spare key means, for example a coded key card, for example only one spare key means at a time, whereby a new consecutive spare key means cancels the code of the previously used key means.

9. Locking system as claimed in claim 7 or 8, c h a r a c t e r i z e d i n that the unit is so adapted that after use as an "off-line" lock it will only accept key means which are coded into the lock from the central unit, possibly accept a spare key means:

a) until the lock is recoded,

b) for a certain time interval after the first use of the spare key means,

c) or until a newly issued key means has been used for the first time.

10. An electronically controlled lock system constructed and adapted to operate substantially as hereinbefore described with reference to, as as illustrated in, the accompanying drawings.

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