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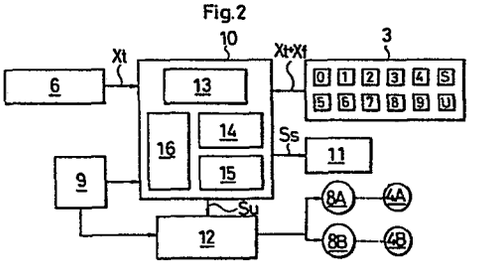
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(54) **Electronic locking device.**

(57) An electronic locking device having a memory circuit (14) for memorizing intrinsic codes and a digital watch (6) to indicate variable codes as time goes. The input-code for unlocking an object is given by calculation of the intrinsic figure and the variable figure. In the control unit (13) the variable figure is deduct from the input-code, and the remainder is identified if it is in agreement with the intrinsic figure. Unlocking is made only when the remainder agrees with the intrinsic figure.

Fig.2



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TITLE OF THE INVENTION

ELECTRONIC LOCKING DEVICE

DETAILED DESCRIPTION OF THE INVENTION

This invention relates to an apparatus to keep a high confidential performance of the electronic locking device which turns an object into locked or unlocked condition by key input of coded symbols from outside.

Compared with mechanical locks for building doors, for example, electronic locks are generally free from such troubles as carrying the key at all times or the possible theft by duplicated pass key, and have higher confidential performance than that of dial keys for safe, and therefore, are used not only for building doors but also for doors of safe and automobiles or suit cases and others.

With conventional types of electronic lock, however, the input key always used is fixed, and therefore, several specific key buttons of the fixed code are hand-stained. The trouble is that unlocking becomes possible by a third person if he tries to push the hand-stained several buttons changing the order in various ways. To prevent this, the push buttons have to be kept always clean so as the specific key may not be identified but ordinarily such is rather

troublesome to practice, and hand-stain of key buttons is a disadvantage for confidential preservation of electronic locks at present.

In view of the foregoing, it is a general object of this invention to improve the confidential performance of electronic locking devices.

Referring now to the drawings, an embodiment of this invention is described as follows.

Referring to Fig. 1, which is a perspective view of a suit case provided with an electronic locking device according to this invention, twelve square buttons 3 shown at the right side of the hanger 2 are arranged on the upper side plate 1H of the suit case 1, which are composed of ten keys (0 - 9) for code input, one switch key (S) and one unlocking key (U). The control unit of the micro-computer 10 for memorizing, comparison and computation of key input is provided in the case 1 near the ten-key 3. The manual knobs 4A,4B for open-shut operation of the suit case are provided at both ends on the upper side plate 1H, and under loched condition of the suit case, these manual knobs are depressed to the level of the upper side plate 1H, as shown by the continuous lines, which are pulled by the solenoids as the control units of the locking device provided inside of the case 1. When the suit case 1 is turned to unlocking condition, the manual knobs 4A, 4B are pushed

up by several mm as shown by the dotted lines, and then by sliding the knobs in arrow directions (a), (b) respectively at the same time, the lid 5 of the suit case can be opened.

The indicator 6 to show the variable component of the code symbols, i.e. the figures that change as time goes, is a digital watch, which indicates a time in hour-minute unit like "PM 12:04" for instance by crystalline liquid letters, and can be adjusted by the digital watch adjusters 7.

Fig. 2 is a block diagram to show the circuit configuration of the electronic locking device according to this invention. The power switch (S) among the key buttons 3 is for ON/OFF operation of the power source 9 for the electronic locking device (DC 6V incorporated battery, for example). The control unit 10 of the micro-computer has the control circuit 13, the memory 14, the relational operation circuit 15 and the clock pulse generating circuit 16. The memory 14 not only memorizes the preset coded symbols, but also memorizes the changing indication of the digital watch 6 every moment and renews the memory. The input figure for unlocking is composed of two components: the figure indicated in the digital watch 6 and the figure preset in the memory 14.
The indicated figure that changes as time goes is the variable component (Xt) of the input coded symbols.
The preset figure memorized in the memory 14 is the

fixed intrinsic component (Xf) of the input coded symbols. If the fixed intrinsic component is "1234", for example, the time indication (Xt=1204) is added to this (Xf=1234), i.e. Xf + Xt = 2438 as the key-input for unlocking. To prevent the said indicated figure "1204" from advancing to "1205" during the key-input in this case, the memory 14 holds the indicated figure from the initial input "2" of the above "2438" to the end of the relational operation in the computation circuit 15. By the key-input of this coded symbols (Xf+Xt), the control unit 10 deducts the said (Xt=1204) to judge if the remainder (ΔX= 1234) is in agreement with the memorized intrinsic component (Xf=1234).

As the order of operation for locking of the suit case, the switch key (S) is turned to ON and the case lid 5 is closed, then the electronic locking device functions to lock the case and the knobs 4A, 4B are depressed as illustrated. To open the suit case, the switch key (S) is turned to ON, and an operator addes up the time indication (Xt=1204) on the digital watch 6 and the preset figure memorized in the control unit (Xf=1234) by mental calculation, then gives the total "2438" as the input code by the ten-key (0 - 9).

When the fixed figure memorized in the control unit 10 which is utilized as the base of the input code at this key-input is correct, ΔX becomes equal to

Xf, and the coincidence signal (Ss) is sent from the control unit 10 to the small sized loudspeaker 11 in the suit case to issue continuous sound. After checking this sound, the operator pushes the unlocking key (U), then the unlocking signal (Su) is given as the output from the control unit 10 to the motor driving control circuit 12. Now the motor driving control circuit 12 applies the voltage of the power source 9 to the solenoids 8A, 8B for operation, thus the knobs 4A, 4B are released. The manual knobs 4A, 4B are pushed up by several mm above the upper side plate 1H as described above, and after that, the operator slides off the knobs to respective side, then the suit case opens.

Described above are on an embodiment of this invention as being applied to a suit case, but the application is not limited to suit cases, as a matter of course. In place of the digital watch as the means to indicate the varying figure that changes as time goes and composes the coded symbols for key-input, a digital counter that counts the clock pulse of the control unit 10 may also be used.

Being composed as described above, this invention offers a convenient locking device that can maintain confidence of the coded symbols strictly almost permanently because the disadvantage of conventional electronic locking device in lowerd confidential

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performance due to hand-stain of some specific key buttons used for the code symbol is now solved by the composite code arrangement of the variable figure and the fixed figure making the frequency of use approximately equal to all the key buttons and avoiding hand-stain of any specific buttons completely, and because it can eliminate such trouble as impossible unlocking due to forgotten coded symbols as the fixed intrinsic figure to be memorized can now be a simple one easy to memorize.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a perspective view of a suit case provided with an electronic locking device as an embodiment of this invention, and

Fig. 2 is a block diagram showing the configuration of the electronic locking device according to this invention.

3 ..... Key buttons
6 ..... Digital watch
8A, 8B ..... Solenoids
10 ..... Control unit of micro-computer
Xt+Xf ..... Composite coded figure
Xf ..... Figure of intrinsic component
Xt ..... Figure of variable component

WHAT IS CLAIMED IS:

1. An electronic locking device including a computer control unit for locking or unlocking by memory of coded symbols supplied from outside and by relational operation of the code information, characterized by comprising a memory circuit for memorizing intrinsic coded symbols and means for generating variable codes as time goes, composite codes of the said intrinsic coded symbols and the said variable codes being operated to enable locking or unlocking.

2. An electronic locking device according to Claim 1, wherein a digital watch to indicate the variable codes that changes as time goes is provided in addition to the locking device.

3. An electronic locking device according to Claim 1, wherein a digital counter to indicate the variable codes that changes as time goes is provided in addition to the locking device.

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Fig.1

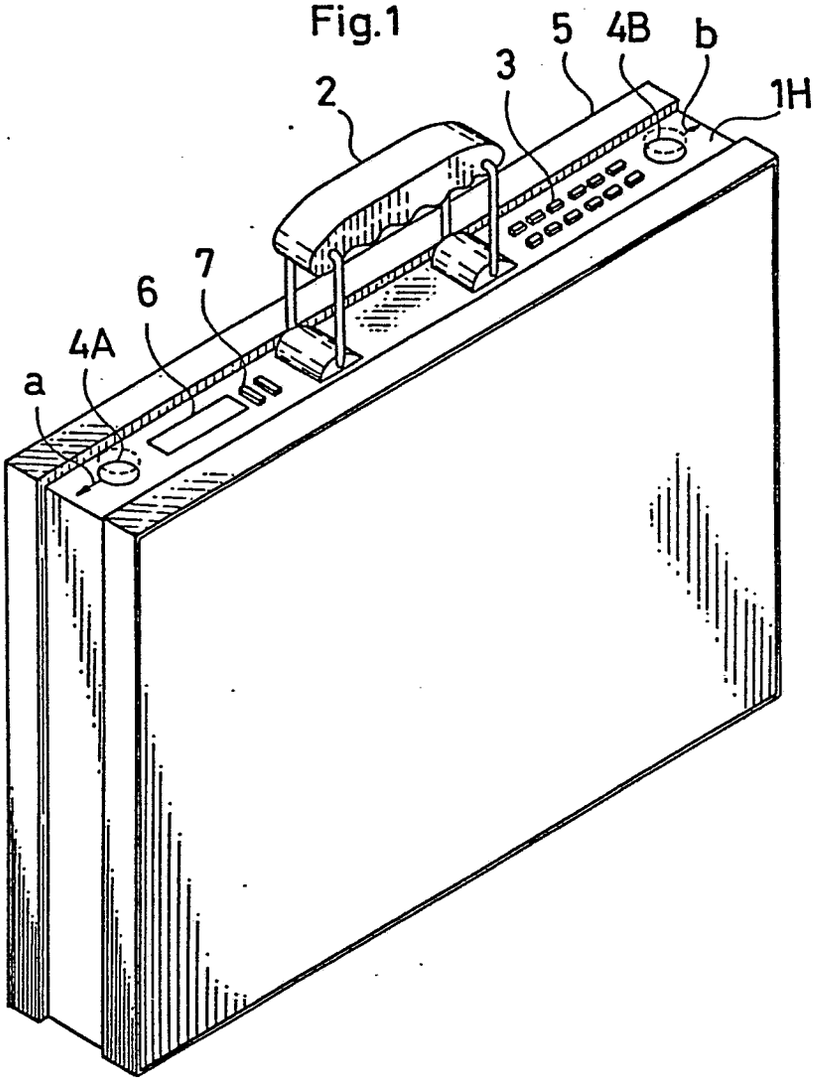
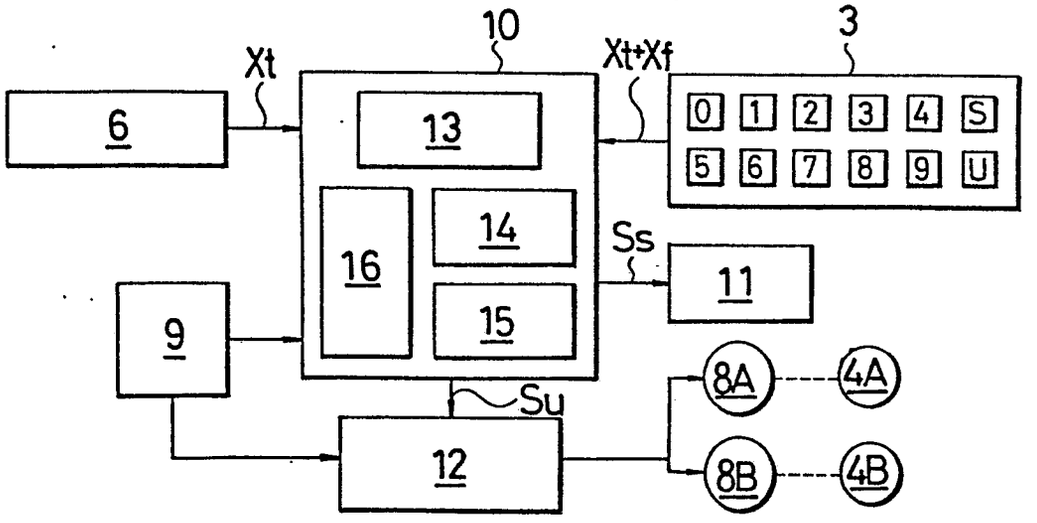

2
3
5
4B
b
1H
6
7
4A
a

Fig.2


10
Xt
Xt+Xf
3
6
13
0 1 2 3 4 S
5 6 7 8 9 U
16
14
15
Ss
11
9
8A
4A
Su
12
8B
4B

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EUROPEAN SEARCH REPORT

Application number
EP 80 10 5971

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	US - A - 3 587 051 (HOVEY) * Figures 1,2; column 2, line 58 - column 3, line 70 *	1,3
A	US - A - 4 093 870 (EPSTEIN)	1,3
A	US - A - 3 893 073 (ANGELLO)	1,3
A	US - A - 3 812 403 (GARTNER)	1,3

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

E 05 B 49/00
G 07 C 11/00

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

E 05 B
G 07 F
G 07 C

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24-09-1981	HERBELET