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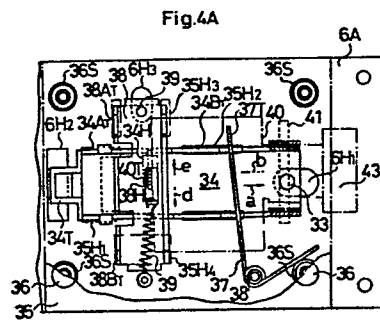
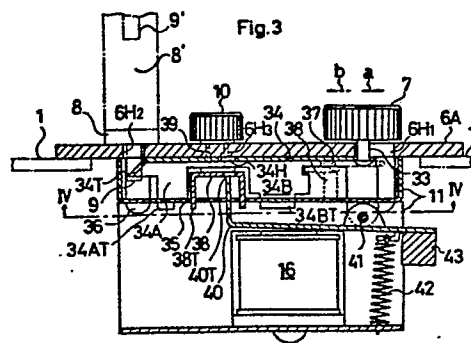
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(54) **Electronic locking device.**

(57) The locking device can be operated by manual operation and by key input selectively depending on various circumstances. At the locking condition, a hole (34H) provided on an unlocking member (34) and a hole (38H) in a retaining mechanism (38) are at the same position to allow the insertion of a moving piece (40) into the both holes; and at unlocking, both of the holes (34H, 38H) are at the different position each other not to allow the insertion of the moving piece into any one of the two holes (34H, 38H).

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TITLE OF THE INVENTION

ELECTRONIC LOCKING DEVICE

DETAILED DESCRIPTION OF THE INVENTION

This invention relates to an electronic locking device for locking or unlocking by memory and relational computing process of the code information given by key input of external memory code, especially relates to an electronic locking device to enable locking or unlocking by manual operation selectively depending on each condition of use intended to be used.

To electronic locking devices that incorporate a micro-computer or sequencer to be locked or unlocked by key input, a number of different contrivances have so far been made to keep a high confidential performance. Unlike the conventional mechanical locks, there is no need to carry the key at all times yet there is no worry for robbery by duplicated skeleton key by other people, and yet the confidential performance is still higher than dial type locks for safe and others.

With conventional electronic locking devices, the emphasis is put on their confidential performance, and therefore, the disadvantage is that the operation is troublesome since key input must be made if there is some other person who is not allowed to know the locking or unlocking code, or even when there is no one near-by

but if the specific person, the owner of the suit case for example, has to open and shut the suit case frequently.

In view of the foregoing, this invention is to offer a device that makes the handling easier to eliminate the disadvantage in the operation of conventional electronic locking device, i.e. to offer a device to be enable locking or unlocking freely by manual operation, by selectively blocking the electronic locking function depending on each circumstances, after turning it to unlocking condition by key input. In other words, the device is so contrived to make manual locking or unlocking possible after turning the object into locked or non-locked condition by operating a motor driving unit through external key input of code.

Referring to Fig. 1, which is the perspective view, showing a suit case provided with an electronic locking device according to this invention. The panel 3 is provided near the hanger 2 in the middle of the case 1. The key button control board 4 is placed below the panel surface 3 by several mm on which ten number keys (0-9) and four function keys are provided. The cover 5 of the control board is provided to be opened up at open-shut operation of the suit case. The clasps 6A and 6B of the case are composed of the two sections like other ordinary suit cases. The clasp 6A has an unlocking

knob 7 to be pushed in the arrow direction (a) by a finger, a hook 8 which springs up as shown by the dotted line 8' because of the spring force when the internal locking mechanism is disengaged by the operation of the said unlocking knob 7, and the latch 9 of the hook. To the clasp 6A, provided besides the above are the operation knob 10 which moves in arrow direction (d) and also the control unit 11 of the electronic locking device interlocked with the clasp 6A in the case 1 for controlling locking and unlocking conditions by key input. A solenoid as the motor driving unit is incorporated inside the control unit 11 and a group of dry batteries of DC6V are mounted so as to be replaced freely as the driving power source for these units. The control unit 11 functions, in case of unlocking, when the code is supplied by correct key input through the control board 4, to disengage the locking mechanism of the control unit 11. The unlocking condition can be checked by the transmission sound of a small sized speaker placed inside the said panel 3. Only when the user pushes the said unlocking knob 7 in arrow direction (a) with his finger after confirming the unlocking sound, the hook 8 springs up as shown by the dotted line 8', and the suit case can be opened. After opening the suit case, the normal power source is turned off to shut off unnecessary current. To close the suit case, key input of the code is given in the same manner as

above, the locked condition is confirmed by the small sized loud-speaker, and the latch 9 is inserted into the clasp 6A by hand as shown by the continuous line, then the locking completes.

Described above is the ordinary open-close operation of the suit case by key input, in which it is done simply by pushing the locking knob 7 of the clasp 6A in the direction (a) and operation of the operation knob 10 is not required. The operation knob 10 is operated to pen or shut the suit case only by manual operation selectively as required after unlocking by the key input as described above. The composition and function of the operation knob 10 are to be described later in detail and now the description is given on the overall composition of the electronic locking device referring to Fig. 1 and Fig. 2. The computer control unit 12 for the operation processing of the above key input, and mercury battery of DC3V as the power source 13 is provided near each other.

Fig. 2 is the block diagram to show a circuit configuration of the electronic locking device according to this invention. Of the fourteen key buttons on the key board 4, the power switch (S) turns on the CPU power source 13 and the control unit power source 14 at locking or unlocking operation. When the lock key (L) is pushed after setting the code number by the ten

key 15, the solenoid 16 of the control unit 11 (within the frame of alternate long and short dashes line) functions to turn the unlocking and locking preparation mechanism 17 to wait-for-locking condition. When the latch 9 is inserted into the clasp 6A after confirming the said transmission sound, then the locking completes. After locking, unnecessary current is cut off by the said power switch (S). When this key is pushed, in opening the suit case, after turning on the power switch (S) and input of the code number by the key 15 to check the transmission sound, then the solenoid 16 and the preparation mechanism 17 are operated to turn the clasp 6A into wait-for-unlocking condition. When the unlocking knob 7 is pushed by a finger in the direction (a) under this condition, the suit case can be opened manually. The mechanism including this unlocking knob 7 is the manual controller 18. The clear key (C) erases wrong input into the ten key 15. The central processing unit 12 is to supply output of locking signal (SL) or unlocking signal (Su) into the driving circuit 19 in case the key input is correct. The relation between the preparation mechanism for locking and unlocking 17 and the automatic retaining mechanism 31 are as follows: the driving circuit 19, receiving the unlocking signal (Su) or the locking signal (SL), makes the solenoid 16 function by the

power source 14, by which the said preparation mechanism 17 become in the possible condition for unlocking, and simultaneously the said automatic retaining mechanism 31 keeps the said condition of the preparation mechanism 17 by a spring incorporated in the retaining mechanism 31. Thus the preparation mechanism 17 is kept under possible condition for locking or unlocking, which makes it possible thereafter to open the suit case freely only by the manual controller, i.e. the unlocking knob 7 of Fig. 1. In case of locking, the manual controller 32, i.e. the operation knob 10 of Fig. 1 is operated by the manual operation, then the said retaining mechanism 31 is released, the interlocking with the preparation mechanism 17 starts from the lock action (AL) of the solenoid 16 by key input, the preparation mechanism 17 is turned to wait-for-locking mode, thus the locking is completed by the manual controller 18.

The structure of the preparation mechanism for locking and unlocking 17 and the automatic retaining mechanism 31 is now described referring to Fig. 3 and Fig. 4. Fig. 3 is a longitudinal sectional view of the operation unit 11 in Fig. 2. Fig. 4A is a partially cutaway view of IV-IV direction and Fig. 4B is a partial diagrammatic view. The lock shaft 34 formed -shape is fixed with the unlocking knob 7 by the rivet 33,

which slides freely in the arrow direction (a) and the return direction (b). In accordance with these motions, the rivet 33 moves freely in the guide hole 6H1. The top of the lock shaft 34T is caught by the latch 9 of the said hook 8. The latch 9 is inserted through the hole 6H2. The fixing cover 35 is fixed to the clasp 6A by the screws 36 through the struts 36S. On the cover 35, the guide holes 35H1 and 35H2 are provided to limit the motion of the lock shaft 34 in both directions (a) and (b), since the top ends 34AT and 34BT are inserted in the said guide holes 35H1 and 35H2. The scissors shaped compression spring 37 is connected to the pin 38, supported by the strut 36S on one end, and pressing the lock shaft 34 in the direction (b) at all times on the other end 37T. The rectangular hole 34H is provided on the lock shaft 34. The top of the moving piece 40T is inserted into the hole 34H when the solenoid is not in operation. Fig. 3 shows the attracting condition of the moving piece 40 by the solenoid 16. The latch shaft 38 of the automatic retaining mechanism is connected to the operation knob 10 by the rivet 39. The traverse of the latch shaft 38 in the directions (c) (d) perpendicular to the moving directions (a)(b) of the said lock shaft 34 is limited by the guide hole 6H3 provided on it. The side plate ends 38AT, 38BT of the latch shaft 38 is connected to the guide holes 35H3 35H4 of the cover 35 so as to slide.

Fig. 4A shows the condition where the latch shaft 38 is released from the restriction of the moving piece 40T to be pulled to the arrow direction (d) by the spring 39. Accordingly, the rectangular hole 38H and the hole 34H are got out of position not to allow the insertion of the moving piece 40T into these holes. The moving piece 40 is driven up and down in Fig. 3 and perpendicular to the drawing in Fig. 4 by the solenoid 16 and the spring 42, around the shaft 41 supported by the bearing in the cover 35 as the fulcrum point. As mentioned before, the drawing shows the condition where the solenoid 16 is operated by the key input of unlocking, the moving piece 40 is drawn, and the top end 40t of it is released from the restriction hole 34H and also from the through hole 38H of the latch shaft. After this, the key (S) is pushed to cut off the current, when the unlocking preparation complete sound is transmitted, and the top of the moving piece 40T is held near the hole 38H by the spring 42 and the balance weight 43 attached to the other end of the moving piece 40. Under this condition, the lock shaft 34 is energized in the arrow direction (b) only by the spring 37, and the top end 34T of it is interlocked with the hook latch 9 keeping wait-for-unlocking condition. This is the function of the retaining mechanism 31, and under this condition, only the push

of the unlocking knob 7, against the force of the spring 37 in the arrow direction (a), opens the suit case, releasing the top of the lock shaft 34T from the hook latch 9. At the closing of the suit case, it is performed only by the insertion of the hook latch 9 into the hole 6H2 on the clasp 6A.

Now referring to Fig. 4B, when the control knob 10 is pushed in the arrow direction (c), the latch shaft 38 moves by (d) against the spring force of the spring 39. Therefore, the hole 38H comes to the position of 38H', where the hole 38H' and the hole 34H are at the same position. Since the width of the hole 38H is wider than that of the top of the moving piece 40T, the top end 40T goes through the hole 38H' and the hole 34H by the force of the spring 42. Thus the movement of the lock shaft 34 in the direction (a) or (b) is restricted. For unlocking this condition, the solenoid 16 must be operated by regular key input. The operation of the knob 10 in the arrow direction (e) can be made freely by the owner at any time depending on the situation.

Described above is an embodiment of the electronic locking device according to this invention applied to a suit case, and the application of this invention is not limited to suit cases, as a matter of course, but is also applicable to other doors, for example, of buildings, safes or automobiles. The mechanisms shown

in Fig. 3 and Fig. 4 are only an example, therefore, it may also be composed of a small D.C. motor in place of the solenoid, and many other mechanisms are conceivable, all of which are within the scope of the present invention without mentioning any further. Being composed as described above, this invention offers a convenient device of easy handling yet maintaining a high confidential performance because of the free selection by the user for manual opening or closing, or key input opening or closing depending on each circumstances.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is an oblique appearance of a suit case mounted with an electronic locking device according to this invention;

Fig. 2 is the block diagram to show the composition of an embodiment of electronic locking device according to this invention;

Fig. 3 is a longitudinal sectional view to show the structure of the locking-unlocking control unit;

Fig. 4A is the partially cutaway view of IV-IV direction; and

Fig. 4B is a partial view of Fig. 4A in a different condition.

- 6A, 6B clasp
- 7 manual unlocking knob
- 8 hook
- 9 hook latch
- 10 control knob
- 12 control unit of micro-computer
- 16 solenoid
- 34 lock shaft
- 38 latch shaft

What is claimed is:

1. An electronic locking device including an electronic control unit which operates a driving unit by code input from outside and performs locking or unlocking, characterized by comprising:
 - (a) an unlocking member moving freely by manual operation of the unlocking knob, when the code input is given, the said unlocking member being interlocked with the said unlocking knob which is operated from outside and having interlocking means for restricting the moving piece of the said driving unit at the locking position when the driving unit is in non-operated condition,
 - (b) a retaining mechanism traversing freely to the said locking member, having interlocking means for restricting the said moving piece, to keep the following conditions: both of the said interlocking means provided on the said unlocking member and in the said retaining mechanism are at the same position each other, in case of the locking condition, and both of the said means are at the different position, in case of the unlocking condition, and
 - (c) an operation knob for releasing the restriction of the said moving piece when the said driving unit is in the non-operated condition.

2. An electronic locking device according to claim 1,
wherein the driving unit is composed of a solenoid.

Fig.1

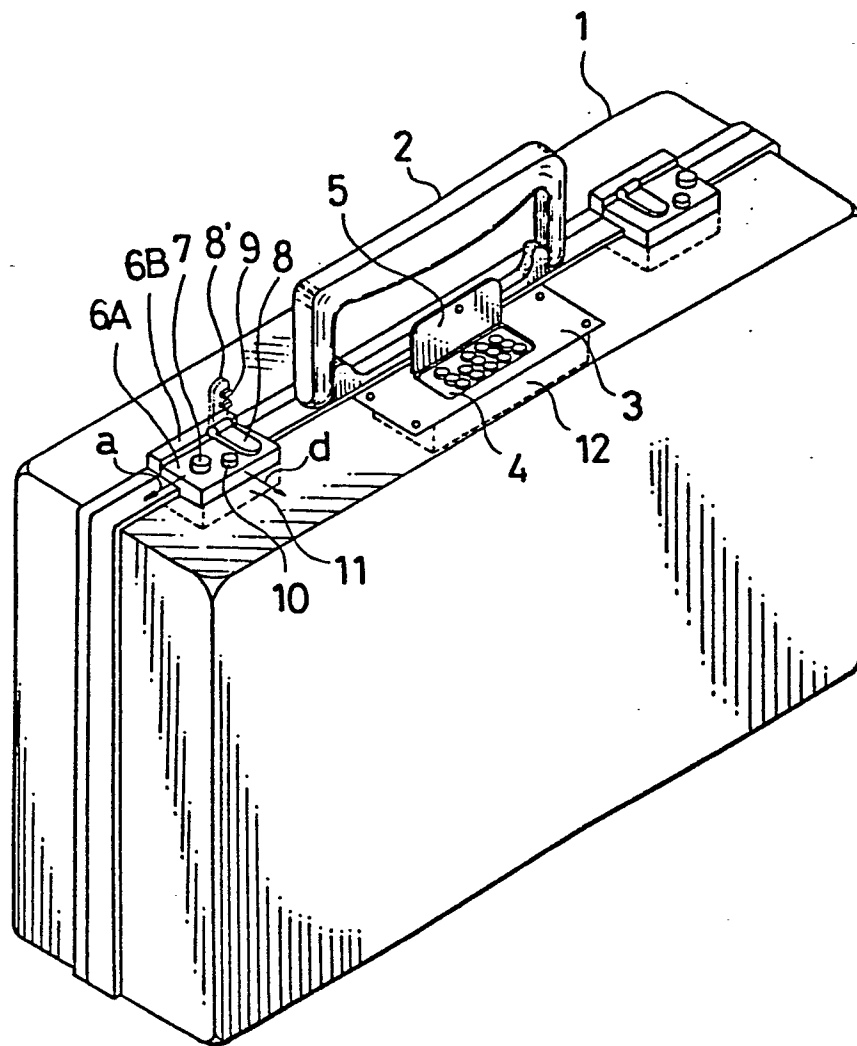
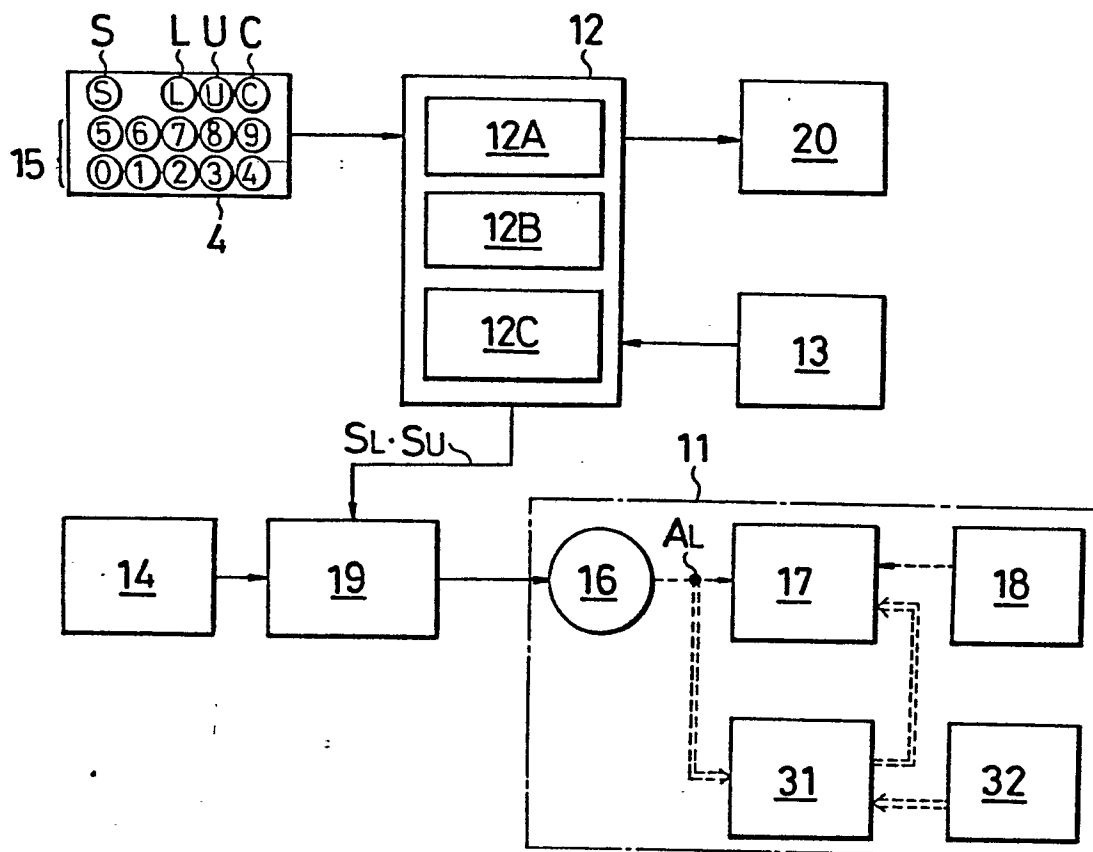
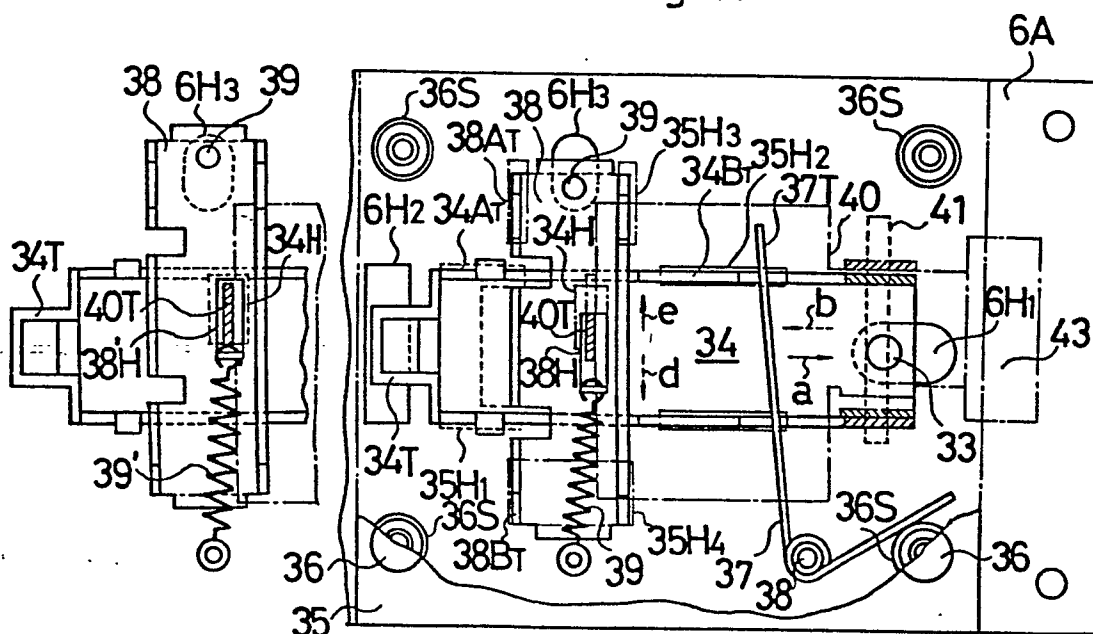


Fig. 2



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Fig.4A



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European Patent
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EUROPEAN SEARCH REPORT

Application number

EP 80 10 5851.2

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
E	DE - A1 - 2 927 808 (B. CONCA) * page 14, line 16 to page 15, line 19; fig. *	1,2	E 05 B 49/00
	DE - A1 - 2 750 052 (HUWIL-WERKE GMBH) * page 7, paragraph 2; fig. 1, 3 * & US - A - 4 220 022	1,2	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			A 45 C 13/00 E 05 B 47/00 E 05 B 49/00 E 05 B 65/00
			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
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☒ The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Berlin		05-05-1981	WUNDERLICH