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Description

[0001] The present invention relates to a small-sized and thin-type electronic key to be attached to a small-sized portable article such as a pocket notebook, a stationery gadget, and a brief case.

[0002] Up to now, a brief case, a portable cash box, or a portable article to be secured for containing an important document, a file and the like has needed a lock device for safety and prevention of crimes, and in order to solve inconvenience caused by loss of a key and the like, an electronic key has been used which makes it possible to lock and unlock by electronically inputting a code number or the like.

[0003] Figures 12 and 13 show examples of electronic keys. In Figure 12, a code number inputted from a ten-key pad 1201 is decoded by a control part 1202 and when the decoded code number coincides with a pre-registered number, the control part 1202 electrically drives and unlocks a latch part 1205 of a lock part 1204 through a cable 1203.

[0004] Figure 13 is a detail view of the lock part 1204, in which a cylinder-shaped motor 1301, which is turned according to a signal from the control part 1202, moves forward or backward the latch part 1205 to lock or unlock by driving a rack 1305 formed in the latch part 1205 with a pinion 1306 through a gear train of gears 1303 and 1304 from a worm gear 1302 fixed on the motor shaft. Such an existing example as this is described, for example, in Japanese laid-open publication Tokkaisho No. 56-34956.

[0005] Figure 14 shows another existing example of the lock part 1204, which uses a solenoid 1401 as an actuator (driving source) instead of a cylinder-shaped motor. A plunger 1402 inside the solenoid 1401 is vertically moved according to a signal from a control part 1202, and a locking or unlocking operation is performed by controlling or releasing movement of a latch bolt 1403 by means of a lever mechanism engaged with the plunger 1402. Such an existing example as this is described, for example, in Japanese laid-open publication Tokkaihei No. 6-323047.

[0006] In the electronic key shown in Figure 12, however, since the ten-key pad 1201 and control part 1202 for controlling the electronic key, and the lock part 1204 for locking and unlocking are composed independently from each other through a cable 1203, although freedom of arrangement of them is expected to some degree, the electronic key comes to be very large in volume as a whole, so such an electronic key cannot be applied to an application field where it is necessary for the key to be small-sized in volume.

[0007] As for composition of the lock part 1204, in the electronic key shown in Figure 13, since the latch part 1205 is driven by the cylinder-shaped motor 1301 through the worm gear 1302, thickness of the lock part 1204 is determined in substance by the diameter of the cylinder-shaped motor 1301, so such a key cannot be applied to an application field where the key needs to be made thin.

[0008] On the other hand, as shown in Figure 14, in a key construction using a solenoid 1402 as an actuator, since a force generated by the solenoid itself is weak, the key part of the electronic key becomes complicated in structure. Therefore, since there is a limit in making the key small and thin, such a key is difficult to attach to a portable article and the like.

[0009] Furthermore, since the solenoid needs to be continuously supplied with electric current to keep the key in a locked or unlocked state or the power consumption is made great for obtaining a necessary force, there has been a problem that a button type cell of silver oxide, lithium, or the like cannot supply a sufficient current due to increase of the cell's internal resistance and comes to be made short in cell life.

[0010] In order to solve the above-mentioned problems, the invention has an object of providing a small-sized and thin-type electronic key makes it possible to simply lock and unlock. For this purpose, the present invention provides an electronic key comprising;

a lock means for locking,

a locking means having a stopper for regulating a movable range of the lock means and an actuator for driving the stopper,

a driving circuit for generating a driving signal to operate the actuator,

a code information inputting means for inputting code information,

a code information storing means for storing a specified signal,

a control circuit for controlling the driving circuit according to a signal inputted from the code information inputting means, and the signal stored in the code information storing means, and

a power source for supplying electric power to the actuator, the driving circuit, the control circuit, and the code information storing means, and characterised in that;

at least two components out of the three components which are the lock means, the locking means and the power source are arranged at positions where they do not sectionally overlap each other, and

the code information inputting means sectionally overlaps at least one component out of the lock means, the locking means and the power source,

[0011] Preferably, the specified signal stored in the code information storing means is set using the code information inputing means.

[0012] Embodiments of the invention will now be described, by way of example only, with reference to the accompanying diagrammatic figures, in which;

Figure 1 is a sectional view of an electronic key of embodiment 1 of the present invention;

Figure 2 is a plan view of the electronic key of embodiment 1 of the invention except its power source

part;

Figure 3 is a system block diagram showing a connection relation between components of the electronic key of embodiment 1 of the invention;

Figures 4A and 4B are outside views of the electronic key of embodiment 1 of the invention seen from two different directions;

Figure 5 is a sectional view of an electronic key of embodiment 2 of the invention;

Figure 6 is a structural view of an ultrasonic motor used in the electronic key of embodiment 2 of the invention;

Figure 7 is a sectional view of an electronic key of embodiment 3 of the invention;

Figure 8 is a sectional view of an electronic key of embodiment 4 of the invention;

Figure 9 is a system block diagram showing a connection relation between components of the electronic key of embodiment 5 of the invention;

Figure 10 is a structural view of an ultrasonic motor used in the electronic key of embodiment 5 of the invention;

Figure 11 is a sectional view of an electronic key of embodiment 6 of the invention;

Figure 12 is a figure showing construction of an existing electronic key;

Figure 13 is a detail view of a lock part of the existing electronic key; and

Figure 14 is another detail view of a lock part of the existing electronic key.

[0013] The present invention makes it possible to make an electronic key small and thin by adopting a composition in which at least two components out of the lock means, the locking means, and the power source which are the main components of the electronic key are arranged at positions where they do not overlap sectionally each other, and the code information inputting means is arranged at a position where it sectionally overlaps at least one component out of the lock means, locking means, and the power source.

[0014] Figure 3 is a system block diagram showing a connection relation among components of an electronic key of the invention. In Figure 3, a code information inputting means 4 inputs a signal for controlling a control circuit 302 included in a driving control means 5.

[0015] The control circuit 302 makes a code information storing means 303 store the signal inputted from the code information inputting means 4.

[0016] A driving circuit 301 outputs a signal for driving an actuator 201 contained in a locking means 2 according to a specified signal from the control circuit 302. The actuator 201, which is driven according to a signal from the driving circuit 301, operates a stopper 202 to regulate a working range of a lock means 1, and determines a locked state or a non-locked state of the electronic key.

[0017] An electric cell 131 inside a power source 3 supplies electric power to the code information storing means 303, the control circuit 302, the driving circuit 301, and the actuator 201.

[0018] The present invention makes it possible to make an electronic key small and thin by adopting the above-mentioned configuration and by flatly arranging the lock means 1 and the locking means 2, or the lock means 1 and the power source 3, or the locking means 2 and the power source 3, or the lock means 1 and the locking means 2 and the power source 3, and making them sectionally overlapping a part or the whole of the code information inputting means 4.

[0019] The actuator 201 is preferably an ultrasonic motor having a flatly turnable rotor or a piezoelectric actuator having a flatly movable slider.

[0020] Alternatively, the actuator 201 may be a flat type electromagnetic motor having a flatly turnable shaft, and may be also, as shown in Figure 10, a stepping motor for clock use 1010 composed of a rotor 1001, a stator 1002, and a coil 1003 which are flatly arranged.

[0021] Figure 9 is another system block diagram showing an alternative connection relation among components of an electronic key of the invention. In Figure 9, a detecting means 901 for detecting a position of the stopper by directly engaging with the stopper 202 is provided. The detecting means 901 issues a specified signal to the control circuit 302 by determining on the basis of a position of the stopper 202 whether the locking means 2 is in a locked state or in a non-locked state. On receiving the signal from the detecting means 901 the control circuit 302 outputs a proper amount of signals for driving the actuator 201 contained in the locking means 2. The actuator 201, which is driven by a proper amount of signals from the driving circuit 301, sets a working range of the lock means 1 by operating the stopper 202 at a proper range and controls a locked state or a non-locked state of the electronic key to be at a secure position.

[0022] The detecting means 901 for detecting a position of the stopper 202 may detect not only the stopper 202 but alternatively the actuator 201 or a transmission wheel 701. Thus, the detecting means 901 may be a detecting means for detecting a position of the stopper 202 which engages with the stopper 202, may be a detecting means for detecting a position of the stopper 202 which engages with the actuator 201, and may also be a detecting means for detecting a position of the stopper 202 which engages with the transmission wheel 701.

[0023] The stopper 202 may be directly driven by the actuator 201, may be driven through a transmission wheel engaging with the actuator 201, and may be also driven by engaging with the actuator 201.

[0024] A cell mounting means 132 can be composed so as to hold the electric cell 131 and make it possible to mount and demount the electric cell 131 from the outside of the electronic key.

[0025] Furthermore, by using a non-volatile memory such as an EEPROM in the code information storing means 303, such information as a code number for un-

locking the electronic key can be kept without being erased even in case that supplying of power from the electric cell 131 is stopped due to exhaustion of the cell or the like. Therefore, such information as a code number stored in advance can continue to be used even at the time of replacing the cell 131 and in case of continuing to use the electronic key, it is unnecessary to perform such an operation as re-registration of the code number.

Embodiment 1

[0026] Figure 1 is a sectional side view of embodiment I of an electronic key of the invention. Figure 2 is a sectional plan view of the electronic key except its power source part. Figures 4A and 4B are outside views of the electronic key.

[0027] In Figure 2, a locking lever 112 inside the electronic key is arranged so as to sway or pivot around a support pin 204 provided in one end part of the locking lever 112. A recessed or dent part 205 is formed at the other end part of the locking lever 112. The locking lever 112 is energised so as to be swayed toward the right in Figure 2, that is, in the direction of the dent part 205, by a tension spring 203 disposed near the support pin 204.

[0028] When a lock pin 206 provided outside the lock mechanism 1 moves to the position of a state B from the position of a state A, the locking lever 112 is swayed toward the left in Figure 2, and when the lock pin 206 moves to the position of the dent part 205 (state B), the locking lever 112 is urged back by the spring 203 and the electronic key comes to be in a locked state by engaging the dent part 205 and the lock pin 206 with each other.

[0029] When unlocking the electronic key, by sliding a slide button 111 to the left in the figure, the locking lever 112 is swayed to the left to disengage the lock pin 206 from the dent part 205 and the electronic key comes to be in an unlocked state.

[0030] from In Figure 1, a method of disengaging the lock pin 206 from the dent part 205 as utilising the slide button 111 has been shown, but since it is possible to unlock the key also by coercively moving the lock pin 206 by hand to the state A in opposition to the energising force of the spring 203, the slide button may be omitted.

[0031] On the other hand, the stopper 202 for regulating a movable range of the locking lever is directly joined to the actuator 201 and the stopper 202 is also turned with turning of the actuator 201, as known from Figure 1.

[0032] At this time, in the case that the stopper 202 is positioned at a state C, the locking lever 112 can be swayed to the left, and since the lock pin 206 can be disengaged from the dent part 205, the lock mechanism is in a non-locked state. In the case that the stopper 202 is positioned in a state D, however, since the locking lever 112 cannot be swayed even by sliding the slide button 111 to the left in the figure, the lock mechanism is in a locked state.

[0033] As for a sectional arrangement of each component composing the electronic key, as shown in Figures 1 and 4A and 4B, the lock mechanism 1 composed of the locking lever 112, the support pin 204, the spring 203 and the slide button 111, the locking part 2 composed of the actuator 201 and the stopper 202, and the power source part 3 composed of the electric cell 131 and the cell holder 132 are arranged flatly in relation to one another.

[0034] Furthermore, a key switch or key pad 4 for inputting a code number and the like is arranged with a control driving part 5 provided with a memory for storing an inputted signal, a control circuit, a driving circuit and the like, and outputs a driving signal for properly operating the actuator 201 according to an inputted signal. This key switch 4 is arranged so as to sectionally overlap the lock mechanism 1, the locking part 2 and the power source part 3, and this arrangement has made the whole electronic key smaller and thinner in size in comparison with an existing electronic key.

[0035] Although Figure 1 has shown an embodiment where all the three components which are the lock mechanism 1, the locking part 2, and the power source part 3 are arranged at positions where they do not overlap sectionally one another (flatly arranged), it is possible to make the electronic key thin also by adopting a configuration where two components out of the three components, namely, the lock mechanism 1 and the locking means 2 or the lock mechanism 1 and the power source 3 or the locking means 2 and the power source 3 are flatly arranged and at the same time the key switch 4 is arranged so as to sectionally overlap these two components, and this configuration is more effective in miniaturisation than the configuration where all the three components are flatly arranged.

[0036] The electric cell 131 is held by the cell mounting means 132 and can be easily mounted and demounted from the outside of the electronic key.

[0037] In this case, by using a non-volatile memory such as an EEPROM in the code information storing means 303, such information as a code number for unlocking the electronic key can be kept without being erased even in case that supplying of power from the electric cell 131 is stopped due to exhaustion of the cell or the like. Therefore, such information as a code number stored in advance can continue to be used even at the time of replacing the cell 131, and in case of continuing to use the electronic key, it is unnecessary to perform such an operation as re-registration of the code number and the like. Further, the lock cannot be disabled by removing the electric cell 131 to erase the code number.

[0038] Figures 4A and 4B are arrangement views of an electronic key. The electric cell 131 is held by the cell holder 132 and is composed so that the electric cell 131 may be easily replaced from the outside of the electronic key.

[0039] The key switch 4 on the upper face of the electronic key is intended for inputting a code number and the like for determining an unlocked state or a locked state of the electronic key, and is provided with a ten-key pad, that is a ten numeral key pad, a star (*) key, and a sharp (#) key.

[0040] Although not illustrated in the figures, it is possible to easily check an inputted code number or the like by simultaneously composing inside the electronic key a display means such as a liquid crystal panel for displaying such information as a code number or the like inputted by the key switch 4, or a pronouncing means with a piezoelectric speaker or the like for checking input of a code number or the like.

Embodiment 2

[0041] Figure 5 is a sectional view of an electronic key of embodiment 2 of the invention.

[0042] In Figure 5, an ultrasonic motor 6 having a flatly turnable rotor is used as an actuator to drive the stopper 202 for regulating a working range of the locking lever 112.

[0043] Figure 6 is a structural view of an ultrasonic motor to be used in the present invention. Plural projections 603a in the shape of comb's teeth are provided at regular intervals on a vibrating member 603. A rotor 602 is in contact with the projections 603a in the shape of comb's teeth of the vibrating member 603 through a friction member. A pressing spring 601 presses the moving member 602 against the projections 603a in the shape of comb's teeth of the vibrating member 603. One or more kinds of high frequency voltages are applied to a piezoelectric vibrator 604 from a piezoelectric vibrator driving circuit. The rotor 602 is turned by a travelling wave or a standing wave generated in the vibrating member 603.

[0044] Since this ultrasonic motor has a feature that its static torque at the time when no electric current flows is great, in order to control the stopper 202 for regulating a movable range of the locking lever, it is not necessary to always make electric current flow in case of keeping the electronic key in either of a locked state or an unlocked state, so it is possible to make an electric cell longer in cell life in case of driving a lock mechanism of an electronic key with the cell.

[0045] Further, since an ultrasonic motor has a greater torque than an electromagnetic actuator, a lock mechanism can be made simpler.

[0046] Furthermore, since the motor itself can be made thin in thickness by adopting an ultrasonic motor of such structure as shown in Figure 6, an electronic key itself becomes thin in thickness as a whole and can be attached to a small-sized portable article and the like.

[0047] Still further, since the invention has the features and performance similar to the case of using the ultrasonic motor shown in Figure 6 also in case of using a piezoelectric actuator having a flatly movable slider, it is possible to make the same configuration as the electronic key as shown in Figure 5.

[0048] In case of using an electromagnetic motor as an actuator for driving a stoppcr used in an electronic key of the invention, it is an absolute condition for making the electronic key small and thin that the motor itself is of thin type.

[0049] As an electromagnetic motor which can be used in the invention, therefore, a flat type electromagnetic motor having a flatly turnable shaft is effective in making an electronic key of thin type.

[0050] Otherwise, a stepping motor for clock use 1010 having a rotor 1001, a stator 1002, and a coil 1003 dispersively arranged can be also adopted as a small-sized and thin-type electromagnetic motor.

Embodiment 3

[0051] Figure 7 is a plan view of a lock mechanism and a locking part of an electronic key of embodiment 3 of the invention. Here, like a case of Figure 2, a power source part is omitted.

[0052] Teeth are formed on the outer circumference of the stopper 202 for regulating a movable range of the locking lever 112 and on the outer circumference of the actuator 201, and the stopper 202 is turned simultaneously with turning of the actuator 201 through a reduction gear train 701.

[0053] Thanks to such a configuration as this, even in the case that an output torque of the actuator 201 to be required for driving the stopper 202 is small, the stopper can be driven by driving it through a reduction gear train 701.

[0054] An effect of raising the degree of freedom for layout of the actuator 201 inside the electronic key can be also obtained by using a gear train.

[0055] This embodiment has shown an example using a gear train, but a similar effect can be obtained also by a transmission wheel system utilising friction by a rubber member and the like instead of a gear part.

[0056] A locking method of the electronic key is the same as in the embodiment 1 shown in Figure 2.

Embodiment 4

[0057] Figure 8 is a plan view of a lock mechanism and a locking part of an electronic key of embodiment 4 of the invention. Here, as in Figure 2, a power source part is omitted.

[0058] The stopper 202 for regulating a movable range of the locking lever 112 is made rectangular in shape, and a groove 803 is formed in one end part of the stopper 202 and engages with a crank pin 802 provided near the outer circumference of the actuator 201.

[0059] Since a support pin 801 is provided near the centre of the stopper 202, the tip of the stopper 202 is moved as the actuator 201 turns. Therefore, a swaying range of the locking lever 112 comes to be regulated by

the stopper 202.

[0060] Since the tip of the stopper 202 is coercively moved downward in Figure 8 by adopting a locking part utilising such a crank mechanism, when pressing the slide button 111 toward the left, the dent part 205 of the locking lever 112 is swayed to the left and the electronic key can be released from a locked state.

[0061] This embodiment has shown an example using a crank mechanism, but it is possible to implement the invention also in a system utilising a link mechanism, a parallel crank mechanism, a cam mechanism and the like as a mechanism for driving the stopper 202.

Embodiment 5

[0062] Figure 10 is a plan view of a lock mechanism and a locking part of an electronic key of embodiment 5 of the invention. Here, as in Figure 2, a power source part is omitted.

[0063] The actuator 201 is composed of a stepping motor for clock use 1010 composed of a coil 1003 for generating magnetism by receiving a specified signal generated from the driving circuit 301, a stator 1002 for inducing the magnetism generated by the coil 1003, and a rotor 1001 turned by receiving the magnetism induced by the stator 1002. Rotation of the rotor 1001 is transmitted to a transmission wheel 701, and then turns the stopper 202 for regulating a movable range of the locking lever 112.

[0064] The stopper 202 is provided with a projection 202A. A terminal 1021 is provided which comes into contact with the stopper's projection 202A when the stopper 202 is turned and comes into a locked state D. Also, a terminal 1022 is provided which comes into contact with the stopper's projection 202A when the stopper 202 is turned and comes into a non-locked state C. A detecting means 901 in this embodiment is composed of the stopper's projection 202A and the terminals 1021 and 1022. The terminals 1021 and 1022 are connected with a control circuit 302, and when the stopper's projection 202A comes into contact with the respective terminals 1021 and 1022, each of the terminals 1021 and 1022 generates a signal for notifying of its contact. The signals issued from the terminals 1021 and 1022 enter the control circuit 302. The control circuit 302 which has received the signals from the terminals 1021 and 1022 controls the driving circuit 301 to generate a signal to drive the actuator 201. By operating in such a manner, the electronic key is surely brought into a locked state D or in a non-locked state C.

[0065] Otherwise, the detecting means may be the actuator 201 and may be also the transmission wheel 701. The detecting means may be a detecting means for detecting a position of a stopper by engaging with the stopper 202, may be also a detecting means for detecting a position of a stopper by engaging with the actuator 201, and may be still also a detecting means for detecting a position of a stopper by engaging with the transmission wheel 701.

Embodiment 6

[0066] Figure 11 is a sectional view of embodiment 6 showing the relation between a power source mounting means 132 and a locking lever 112. This embodiment has a structure in which a part 1101 of the power source mounting means 132 for mounting and demounting an electric cell 131 which is a power source 3 and a part 1102 of the locking lever 112 are engaged with each other in a locked state and the power source mounting means 132 cannot be mounted and demounted from the outside.

[0067] When the stopper which is a locking means is turned and comes into a non-locked state C, since the locking lever 112 can freely move in a space 1103, the electric cell 131 can be mounted and demounted by moving the power source mounting means 132. and it is possible to prevent a risk that the electric cell in a locked state is demounted by mistake.

[0068] In the Figures, a tension spring 203 is shown pulling the locking lever 112. This could be replaced by a compression or rotational biasing member and a biasing member other than a spring could be used. Finally, the spring 203 and support pin 204 could be deleted and the locking lever 112 itself comprise an integral biasing means.

[0069] As described above, the present invention can implement a small-sized and thin-type electronic key which can be easily locked and unlocked and also can make its electric cell longer in cell life even in case of keeping the electronic key in either of a locked or a non-locked state for a long time by providing the electronic key comprising;

a lock means for locking,

a locking means having a stopper for regulating a movable range of the locking means and an actuator for driving the stopper,

a driving circuit for generating a driving signal for operating the actuator,

a code information inputting means for setting and inputting a code information,

a control circuit for controlling the driving circuit according to a signal inputted from the code inputting means,

a code information storing means for storing a specified signal inputted from the code information inputting means, and

a power source for supplying electric power to the actuator, the driving circuit, the control circuit, and the code information storing means, wherein;

at least two components out of the three components which are the lock means, the locking means, and the power source are arranged at positions where they do not overlap sectionally each other and the code information inputting means is arranged at a position where it sectionally overlaps at least one component out

of the lock means, the locking means, and the power source. Furthermore, by providing a detecting means for detecting whether the key is in a locked state or in a non-locked state, the invention can implement a small-sized and thin-type electronic key of higher reliability.

[0070] The aforegoing description has been given by way of example only and it will be appreciated by a person skilled in the art that modifications can be made without departing from the scope of the present invention.

Claims

1. An electronic key comprising;

a lock means (1) for locking,

a locking means (2) having a stopper (202) for regulating a movable range of the lock means (1) and an actuator (201) for driving the stopper (202),

a driving circuit (301) for generating a driving signal to operate the actuator (201),

a code information inputting means (4) for inputting code information,

a code information storing means (303) for storing a specified signal,

a control circuit (302) for controlling the driving circuit (301) according to a signal inputted from the code information inputting means (4), and the signal stored in the code information storing means (303), and

a power source (3) for supplying electric power to the actuator (201), the driving circuit (301), the control circuit (302), and the code information storing means (303), and **characterised in that**;

at least two components out of the three components which are the lock means (1), the locking means (2) and the power source (3) are arranged at positions where they do not sectionally overlap each other, and

the code information inputting means (4) sectionally overlaps at least one component out of the lock means (1), the locking means (2) and the power source (3).

2. An electronic key as defined in claim 1, wherein;

the lock means (1) and the locking means (2) are arranged at positions where they do not sectionally overlap each other.

3. An electronic key as defined in claim 1, wherein;

the lock means (1) and the power source (3) are arranged at positions where they do not sectionally overlap each other.

4. An electronic key as defined in claim 1, wherein;

the locking means (2) and the power source (3) are arranged at positions where they do not sectionally overlap each other.

5. An electronic key as defined in claim 1, wherein;

the lock means (1), the locking means (2), and the power source (3) are arranged at positions where they do not sectionally overlap one another.

6. An electronic key as defined in any preceding claim, wherein;

the actuator (201) is an ultrasonic motor (6) having a flatly turnable rotor.

7. An electronic key as defined in any one of claims 1 to 5, wherein;

the actuator (201) is a piezoelectric actuator having a flatly movable slider.

8. An electronic key as defined in any one of claims 1 to 5, wherein;

the actuator (201) is a flat-type electromagnetic motor having a flatly turnable shaft.

9. An electronic key as defined in any one of claims 1 to 5, wherein;

the actuator (201) is a stepping motor (1010) composed of a rotor (1001), a stator (1002), and a coil (1003) which are flatly arranged.

10. An electronic key as defined in any preceding claim, wherein;

the stopper (202) is directly driven by the actuator (201).

11. An electronic key as defined in any one of claims 1 to 9, wherein;

the stopper (202) is driven through a transmission wheel (701) engaging with the actuator (201).

12. An electronic key as defined in any one of claims 1 to 10, wherein;

the stopper (202) is driven by engaging with the actuator (201).

13. An electronic key as defined in any preceding claim, wherein;

the actuator (201) is provided with a detecting means (901) for detecting a position of the stopper (202).

14. An electronic key as defined in any one of claims 1 to 12, wherein;

the stopper (202) is provided with a detecting means (901) for detecting a position of the stopper (202).

15. An electronic key as defined in claim 11, wherein;

the transmission wheel (701) is provided with a detecting means (901) for detecting a position of the stopper (202).

16. An electronic key as defined in claim 13, wherein the detecting means (901) is adapted to engage with the actuator (201) to detect a position of the stopper (202).

17. An electronic key as defined in claim 14, wherein the detecting means (901) is adapted to engage with the stopper (202) to detect a position of the stopper (202).

18. An electronic key as defined in claim 15, wherein the detecting means (901) is adapted to engage with the transmission wheel (701) to detect a position of the stopper (202).

19. An electronic key as defined in any preceding claim, wherein;

the power source (3) has an electric cell (131) for supplying electric power to the actuator (201), the driving circuit (301), the control circuit (302) and the code information storing means (303), and a power source mounting means (132) which makes it possible to mount and demount the electric cell (131) from the outside.

20. An electronic key as defined in claim 19, wherein;

the power source mounting means (132) making it possible to mount and demount the electric cell (131) from the outside is a power source mounting means (132) which is adapted to operate only when the lock means (1) is unlocked.

Patentansprüche

1. Elektronischer Schlüssel, umfassend:

ein Verriegelungsmittel (1) zum Verriegeln,

ein Blockiermittel (2) mit einem Stopper (202) zum Einstellen eines Bewegungsbereiches des Verriegelungsmittels (1) und einem Aktuator (201) zum Antreiben des Stoppers (202),

eine Ansteuerschaltung (301) zum Erzeugen eines Ansteuersignals zum Betätigen des Aktuators (201),

ein Codeinformationeingabemittel (4) zum Eingeben einer Codeinformation,

ein Codeinformationspeichermittel (303) zum Speichern eines spezifizierten Signals,

eine Steuerschaltung (302) zum Steuern der Ansteuerschaltung (301) entsprechend einem von dem Codeinformationeingabemittel (4) eingegebenen Signal und dem in dem Codeinformationspeichermittel (303) gespeicherten Signal, und

eine Energiequelle (3) zum Zuführen von elektrischer Energie zu dem Aktuator (201), der Ansteuerschaltung (301), der Steuerschaltung (302) und dem Codeinformationspeichermittel (303), und **dadurch gekennzeichnet, dass**

wenigstens zwei Komponenten von den drei Komponenten, welche das Verriegelungsmittel (1), das Blockiermittel (2) und die Energiequelle (3) sind, an Stellen angeordnet sind, an welchen diese nicht sektional einander überlappen, und

das Codeinformationeingabemittel (4) wenigstens eine Komponente von dem Verriegelungsmittel (1), dem Blockiermittel (2) und der Energiequelle (3) sektional überlappt.

2. Elektronischer Schlüssel nach Anspruch 1, wobei das Verriegelungsmittel (1) und das Blockiermittel (2) an Stellen angeordnet sind, an welchen diese nicht sektional einander überlappen.

3. Elektronischer Schlüssel nach Anspruch 1, wobei das Verriegelungsmittel (1) und die Energiequelle (3) an Stellen angeordnet sind, an welchen diese nicht sektional einander überlappen.

4. Elektronischer Schlüssel nach Anspruch 1, wobei das Blockiermittel (2) und die Energiequelle (3) an Stellen angeordnet sind, an welchen diese nicht sektional einander überlappen.

5. Elektronischer Schlüssel nach Anspruch 1, wobei das Verriegelungsmittel (1), das Blockiermittel (2) und die Energiequelle (3) an Stellen angeordnet sind, an welchen diese nicht sektional einander überlappen.

6. Elektronischer Schlüssel nach einem vorangehenden Anspruch, wobei der Aktuator (201) ein Ultraschallmotor (6) mit einem flach drehbaren Rotor ist.

7. Elektronischer Schlüssel nach einem der Ansprüche 1 bis 5, wobei der Aktuator (201) ein piezoelektrischer Aktuator mit einem flach bewegbaren Gleitstück ist.

8. Elektronischer Schlüssel nach einem der Ansprüche 1 bis 5, wobei der Aktuator (201) ein elektromagnetischer Flachmotor mit einer flach drehbaren Welle ist.

9. Elektronischer Schlüssel nach einem der Ansprüche 1 bis 5, wobei der Aktuator (201) ein Schrittmo-

tor (1010) ist, der aus einem Rotor (1001), einem Stator (1002) und einer Spule (1003) gebildet ist, die flach angeordnet sind.

10. Elektronischer Schlüssel nach einem vorangehenden Anspruch, wobei der Stopper (202) direkt durch den Aktuator (201) angetrieben wird.

11. Elektronischer Schlüssel nach einem der Ansprüche 1 bis 9, wobei der Stopper (202) über ein Getrieberad (701) angetrieben wird, welches mit dem Aktuator (201) in Eingriff steht.

12. Elektronischer Schlüssel nach einem der Ansprüche 1 bis 10, wobei der Stopper (202) durch eine Kopplung mit dem Aktuator (201) angetrieben wird.

13. Elektronischer Schlüssel nach einem vorangehenden Anspruch, wobei der Aktuator (201) mit einem Erfassungsmittel (901) zum Erfassen einer Stellung des Stoppers (202) versehen ist.

14. Elektronischer Schlüssel nach einem der Ansprüche 1 bis 12, wobei der Stopper (202) mit einem Erfassungsmittel (901) zum Erfassen einer Stellung des Stoppers (202) versehen ist.

15. Elektronischer Schlüssel nach Anspruch 11, wobei das Getrieberad (701) mit einem Erfassungsmittel (901) zum Erfassen einer Stellung des Stoppers (202) versehen ist.

16. Elektronischer Schlüssel nach Anspruch 13, wobei das Erfassungsmittel (901) dazu ausgebildet ist, mit dem Aktuator (201) in Eingriff zu gelangen, um eine Stellung des Stoppers (202) zu erfassen.

17. Elektronischer Schlüssel nach Anspruch 14, wobei das Erfassungsmittel (901) dazu ausgebildet ist, mit dem Stopper (202) in Eingriff zu gelangen, um eine Stellung des Stoppers (202) zu erfassen.

18. Elektronischer Schlüssel nach Anspruch 15, wobei das Erfassungsmittel (901) dazu ausgebildet ist, mit dem Getrieberad (701) in Eingriff zu gelangen, um eine Stellung des Stoppers (202) zu erfassen.

19. Elektronischer Schlüssel nach einem vorangehenden Anspruch, wobei die Energiequelle (3) eine elektrische Zelle (131) zum Zuführen von elektrischer Energie zu dem Aktuator (201), der Ansteuerschaltung (301), der Steuerschaltung (302) und dem Codeinformationspeichermittel (303), sowie ein Energiequellenanbringungsmittel (132) aufweist, welches es ermöglicht, die elektrische Zelle (131) von außen zu montieren und zu demontieren.

20. Elektronischer Schlüssel nach Anspruch 19, wobei das Energiequellenanbringungsmittel (132), welches es ermöglicht, die elektrische Zelle (131) von außen zu montieren und zu demontieren, ein Energiequellenanbringungsmittel (132) ist, welches dazu ausgebildet ist, nur dann zu funktionieren, wenn das Verriegelungsmittel (1) entriegelt ist.

Revendications

1. Clé électronique comprenant :

un moyen formant verrou (1) pour verrouiller,
un moyen de verrouillage (2) comprenant une butée (202) pour régler une plage de déplacement du moyen formant verrou (1) et un actionneur (201) pour entraîner la butée (202),
un circuit d'attaque (301) pour produire un signal d'attaque afin de commander l'actionneur (201),
un moyen d'entrée d'information codée (4) pour entrer une information codée,
un moyen de stockage d'information codée (303) pour stocker un signal spécifié,
un circuit de commande (302) pour commander le circuit d'attaque (301) conformément à un signal délivré en entrée depuis le moyen d'entrée d'information codée (4), et au signal stocké dans le moyen de stockage d'information codée (303), et
une source d'énergie (3) pour alimenter en énergie électrique l'actionneur (201), le circuit d'attaque (301), le circuit de commande (302) et le moyen de stockage d'information codée (303), et **caractérisée en ce que** :

au moins deux composants, parmi les trois composants qui sont le moyen formant verrou (1), le moyen de verrouillage (2) et la source d'énergie (3), sont disposés à des positions où ils ne se chevauchent pas les uns les autres par sections, et
le moyen d'entrée d'information codée (4) chevauche par sections au moins un composant parmi le moyen formant verrou (1), le moyen de verrouillage (2) et la source d'énergie (3).

2. Clé électronique selon la revendication 1, dans laquelle :

le moyen formant verrou (1) et le moyen de verrouillage (2) sont disposés à des positions où ils ne se chevauchent pas l'un l'autre par sections.

3. Clé électronique selon la revendication 1, dans laquelle :

le moyen formant verrou (1) et la source d'énergie (3) sont disposés à des positions où ils ne se chevauchent pas l'un l'autre par sections.

4. Clé électronique selon la revendication 1, dans laquelle :

le moyen de verrouillage (2) et la source d'énergie (3) sont disposés à des positions où ils ne se chevauchent pas l'un l'autre par sections.

5. Clé électronique selon la revendication 1, dans laquelle :

le moyen formant verrou (1), le moyen de verrouillage (2) et la source d'énergie (3) sont disposés à des positions où ils ne se chevauchent pas les uns les autres par sections.

6. Clé électronique selon l'une quelconque des revendications précédentes, dans laquelle :

l'actionneur (201) est un moteur à ultrasons (6) comportant un rotor mobile en rotation dans un plan.

7. Clé électronique selon l'une quelconque des revendications 1 à 5, dans laquelle :

l'actionneur (201) est un actionneur piézoélectrique comportant un coulisseau mobile dans un plan.

8. Clé électronique selon l'une quelconque des revendications 1 à 5, dans laquelle :

l'actionneur (201) est un moteur électromagnétique de type plan comportant un arbre mobile en rotation dans un plan.

9. Clé électronique selon l'une quelconque des revendications 1 à 5, dans laquelle :

l'actionneur (201) est un moteur pas à pas (1010) composé d'un rotor (1001), d'un stator (1002) et d'une bobine (1003) qui sont disposés dans un plan.

10. Clé électronique selon l'une quelconque des revendications précédentes, dans laquelle :

la butée (202) est entraînée directement par l'actionneur (201).

11. Clé électronique selon l'une quelconque des revendications 1 à 9, dans laquelle :

la butée (202) est entraînée par l'intermédiaire d'une roue de transmission (701) en prise avec l'actionneur (201).

12. Clé électronique selon l'une quelconque des revendications 1 à 10, dans laquelle :

la butée (202) est entrainée en étant en prise avec l'actionneur (201).

13. Clé électronique selon l'une quelconque des revendications précédentes, dans laquelle :

l'actionneur (201) est muni d'un moyen de détection (901) pour détecter une position de la butée (202).

14. Clé électronique selon l'une quelconque des revendications 1 à 12, dans laquelle :

la butée (202) est munie d'un moyen de détection (901) pour détecter une position de la butée (202).

15. Clé électronique selon la revendication 11, dans laquelle :

la roue de transmission (701) est munie d'un moyen de détection (901) pour détecter une position de la butée (202).

16. Clé électronique selon la revendication 13, dans laquelle le moyen de détection (901) est conçu pour entrer en prise avec l'actionneur (201) afin de détecter une position de la butée (202).

17. Clé électronique selon la revendication 14, dans laquelle le moyen de détection (901) est conçu pour entrer en prise avec la butée (202) afin de détecter une position de la butée (202).

18. Clé électronique selon la revendication 15, dans laquelle le moyen de détection (901) est conçu pour entrer en prise avec la roue de transmission (701) afin de détecter une position de la butée (202).

19. Clé électronique selon l'une quelconque des revendications précédentes, dans laquelle :

la source d'énergie (3) comporte une pile électrique (131) pour alimenter en énergie électrique l'actionneur (201), le circuit d'attaque (301), le circuit de commande (302) et le moyen de stockage d'information codée (303), et un moyen de montage de source d'énergie (132) qui permet de monter et de démonter la pile électrique (131) depuis l'extérieur.

20. Clé électronique selon la revendication 19, dans

laquelle :

le moyen de montage de source d'énergie (132) permettant de monter et de démonter la pile électrique (131) depuis l'extérieur est un moyen de montage de source d'énergie (132) qui est conçu pour fonctionner seulement lorsque le moyen formant verrou (1) est déverrouillé.

FIG. 1

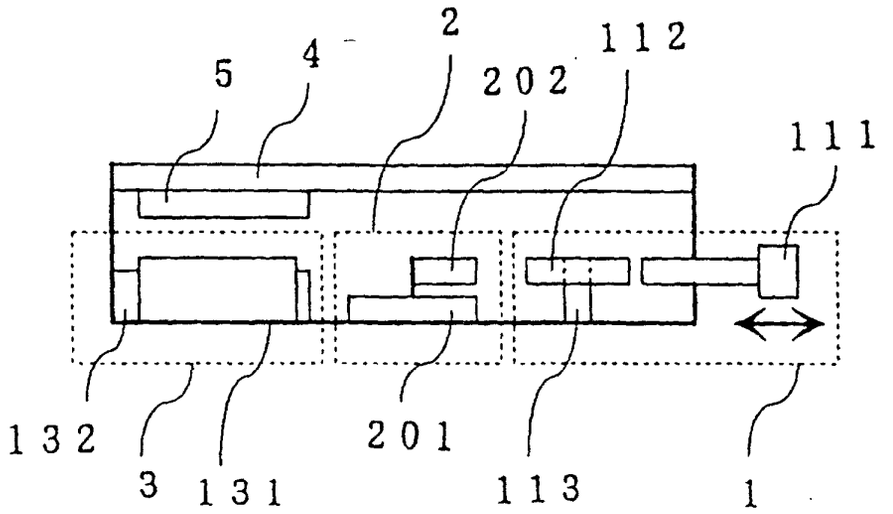

2
112
5
4
202
111
132
3
131
201
113
1

FIG. 2

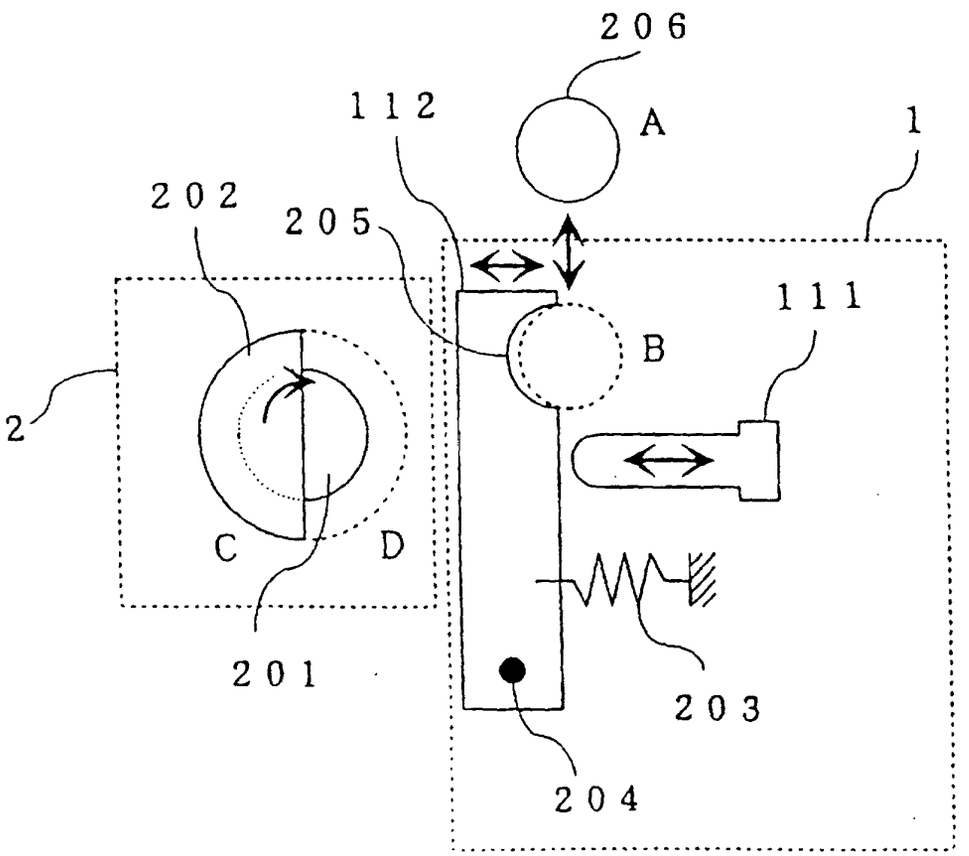

206
112
A
1
202
205
111
B
2
C
D
201
203
204

FIG. 3

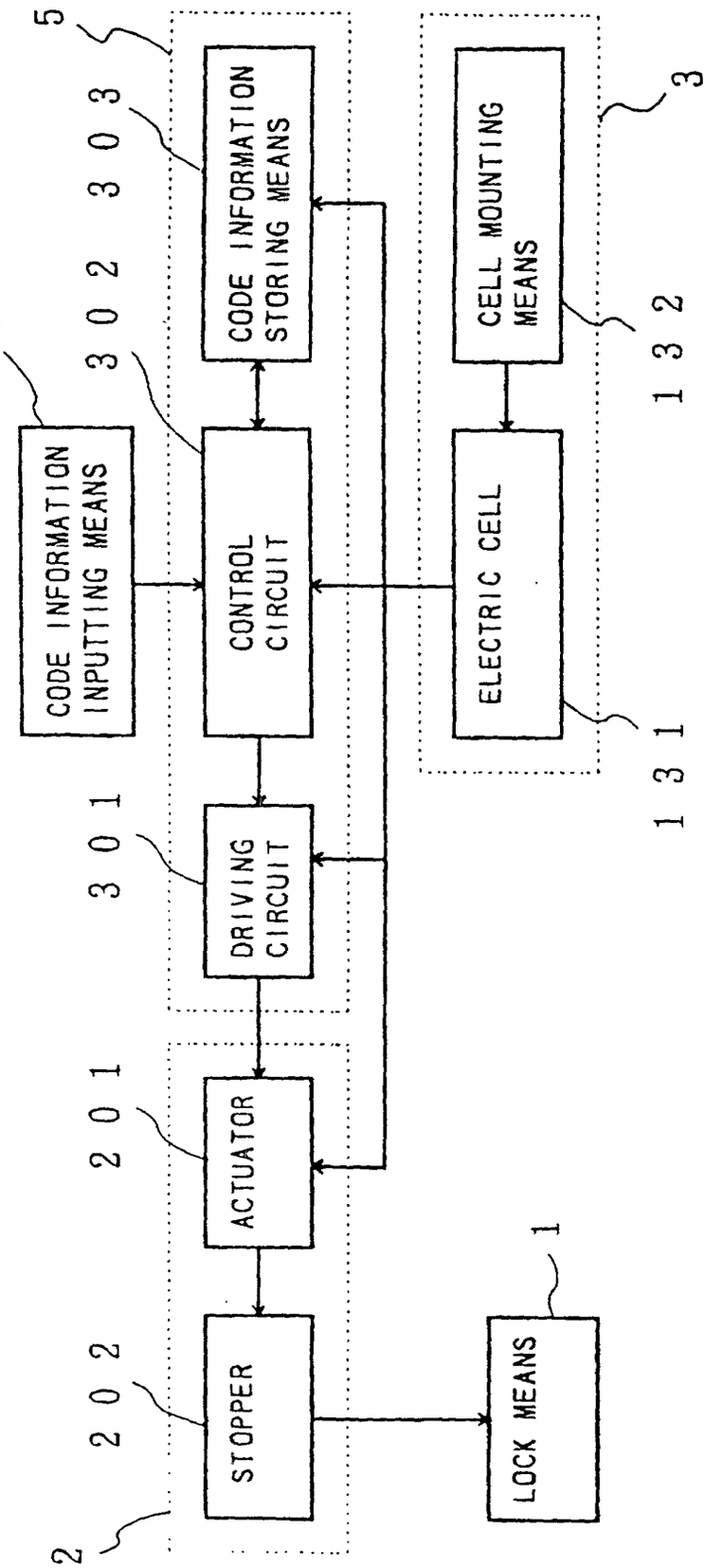

5
CODE INFORMATION STORING MEANS
303
CELL MOUNTING MEANS
3
4
302
1321
CODE INFORMATION INPUTTING MEANS
CONTROL CIRCUIT
ELECTRIC CELL
1311
301
DRIVING CIRCUIT
201
ACTUATOR
202
STOPPER
2
LOCK MEANS
1

FIG. 4A

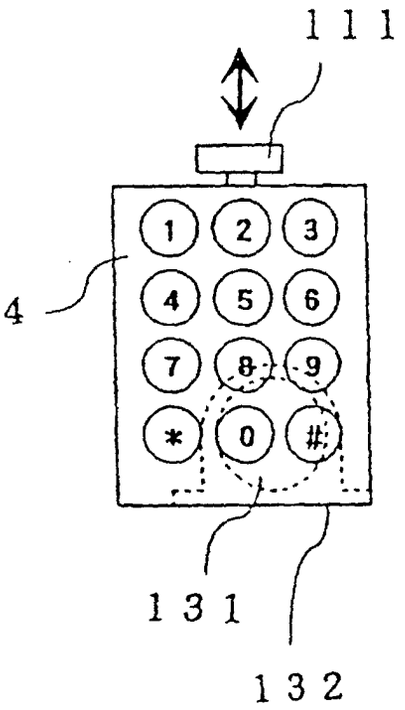


FIG. 4B

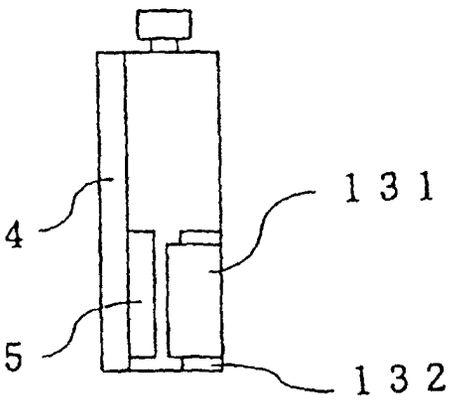


FIG. 5

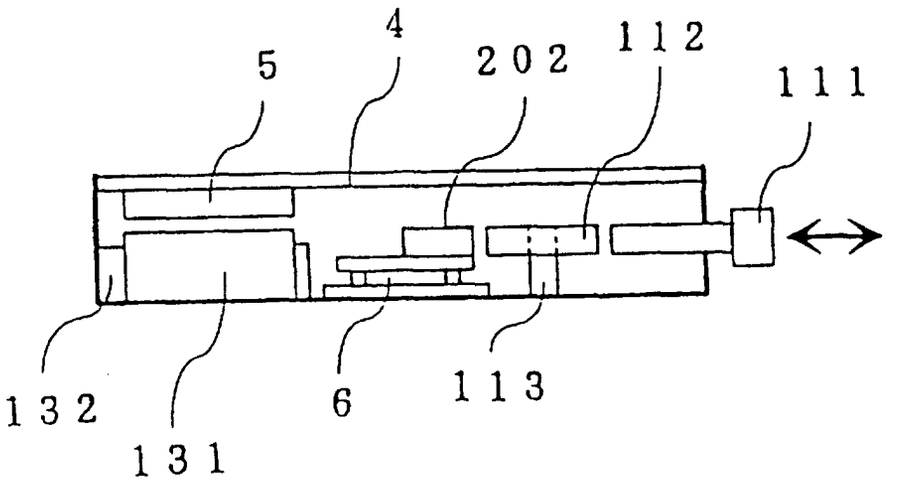


FIG. 6

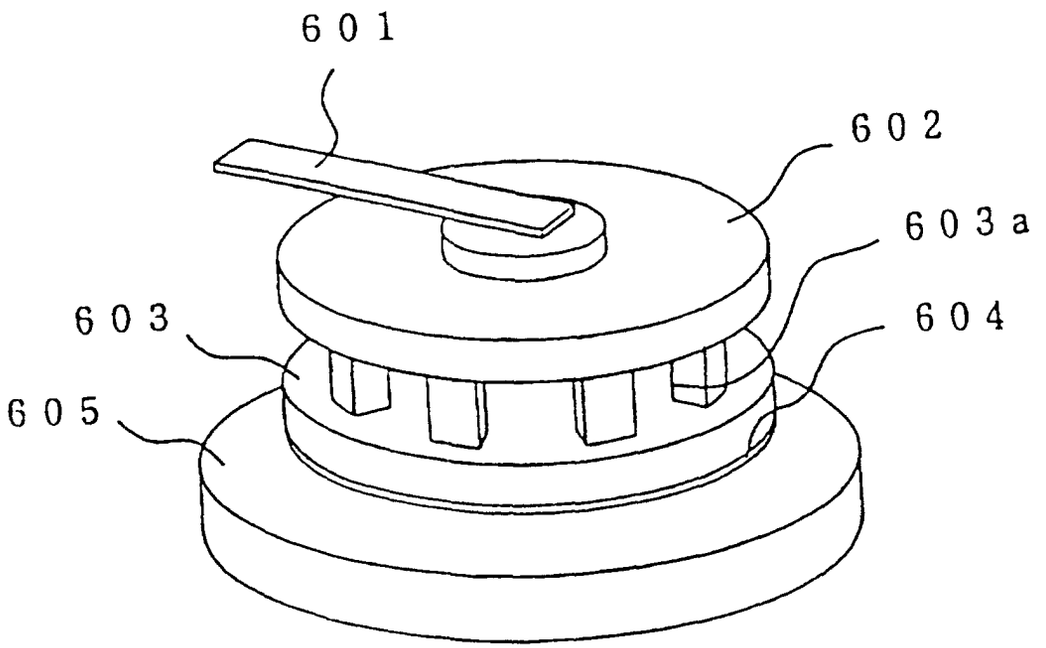


FIG. 7

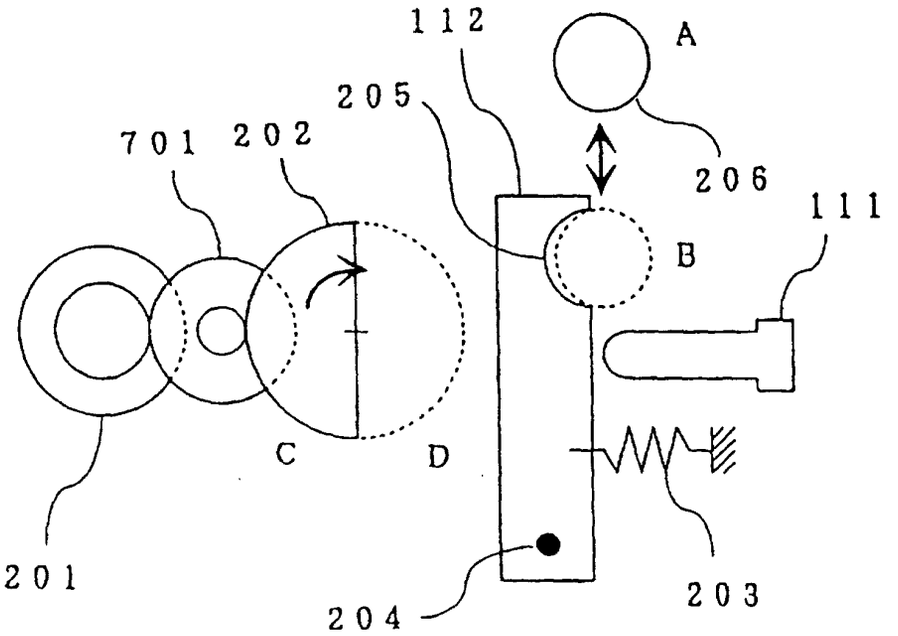

112
A
205
206
701
202
111
B
C
D
201
204
203

FIG. 8

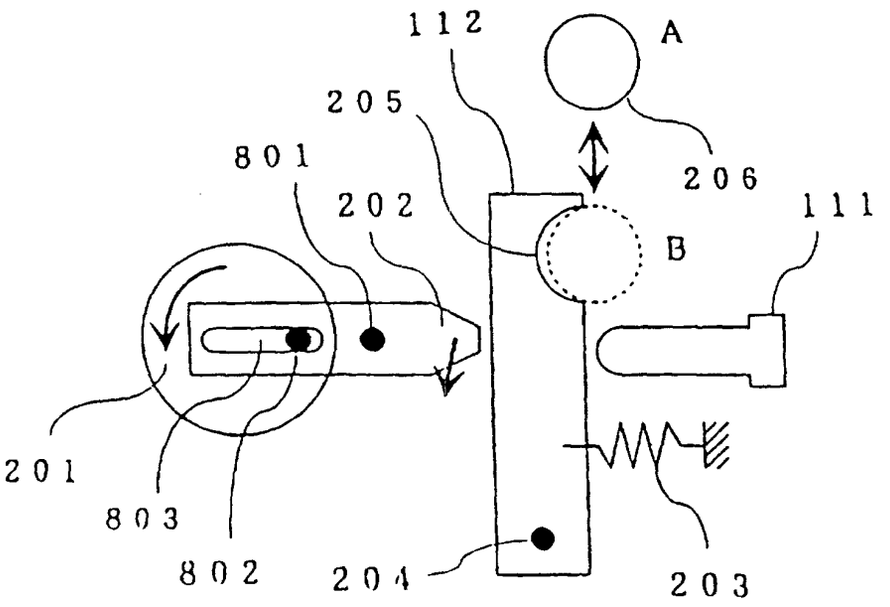

112
A
205
206
801
202
111
B
201
803
802
204
203

FIG. 9

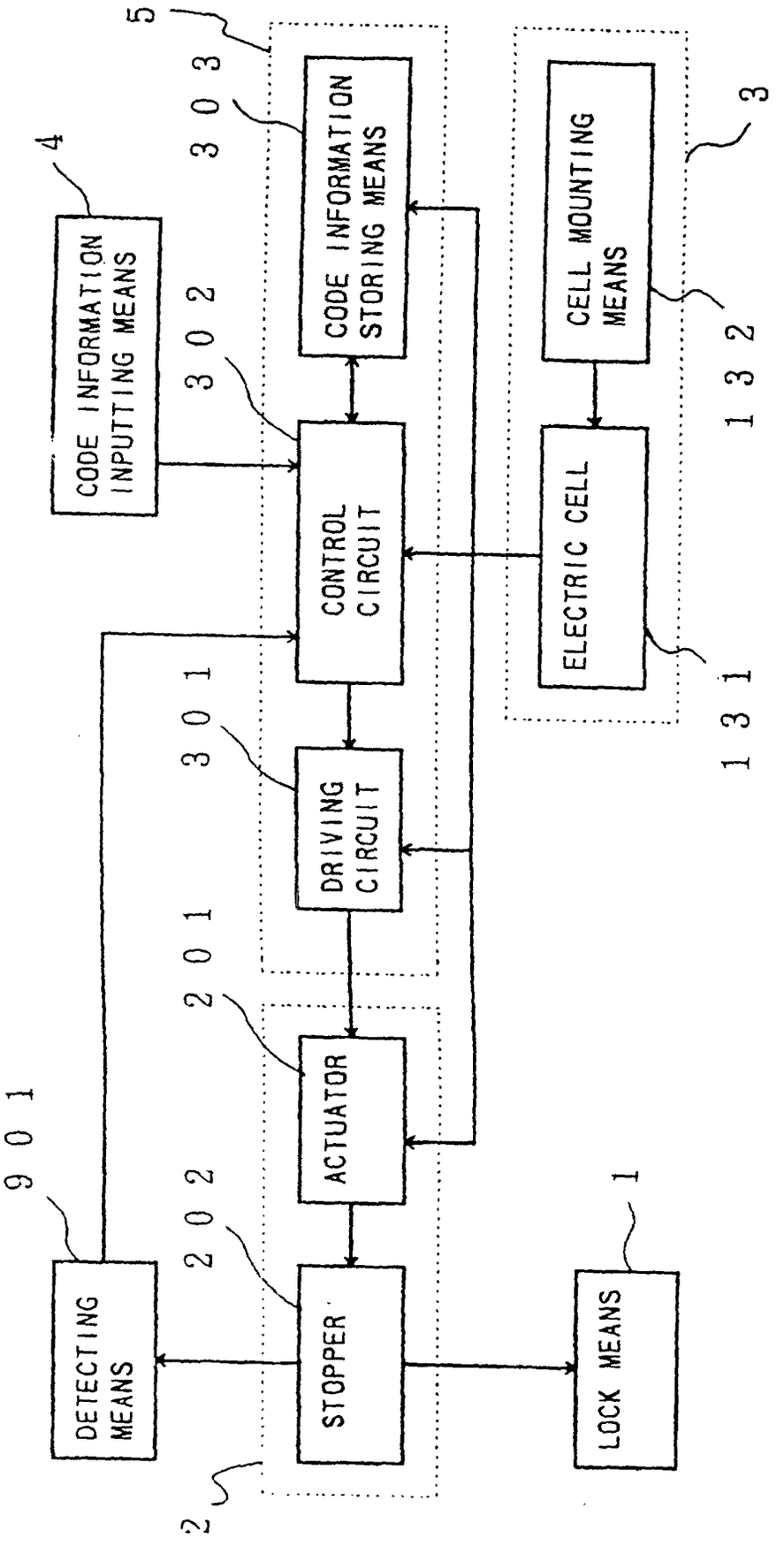

5
303
4
CODE INFORMATION INPUTTING MEANS
302
CODE INFORMATION STORING MEANS
CELL MOUNTING MEANS
3
CONTROL CIRCUIT
ELECTRIC CELL
1332
301
DRIVING CIRCUIT
1331
201
2
901
ACTUATOR
202
DETECTING MEANS
STOPPER
1
LOCK MEANS

FIG. 10

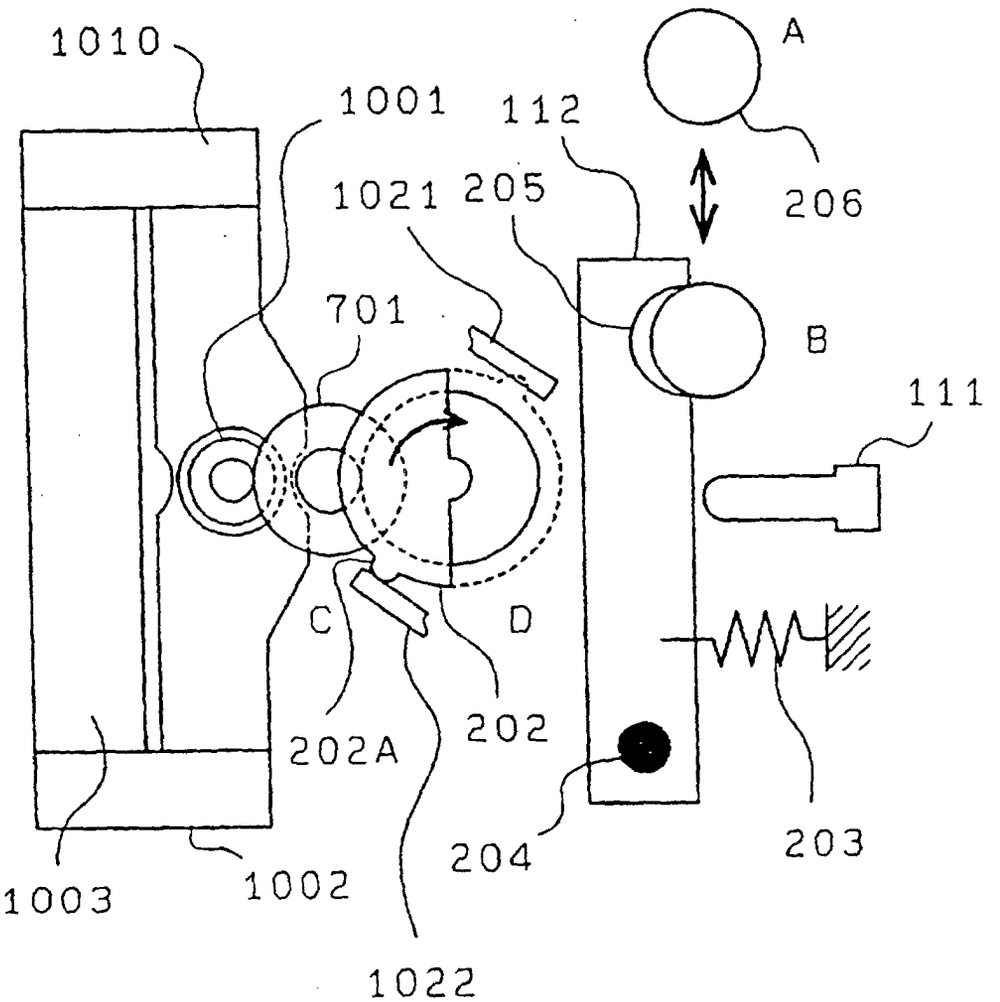

1010
1001
112
A
206
1021
205
701
B
111
C
D
202A
202
204
203
1003
1002
1022

FIG. 11

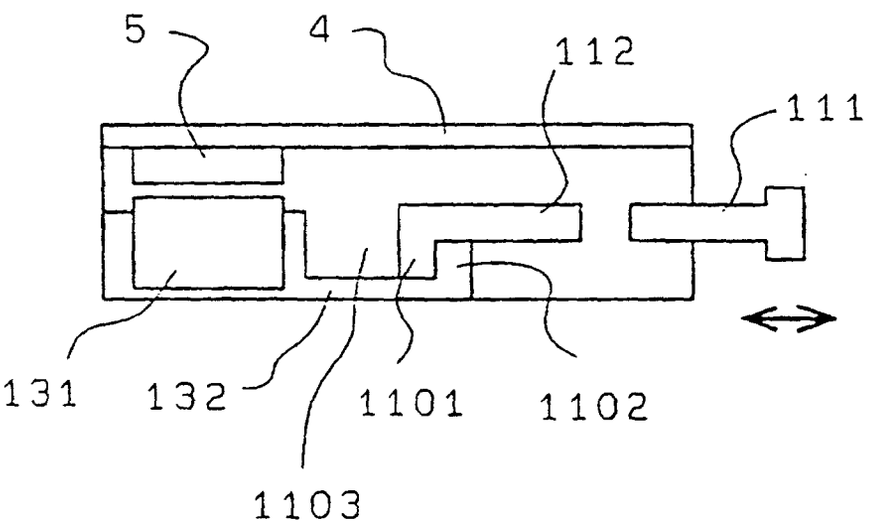


FIG. 12
PRIOR ART

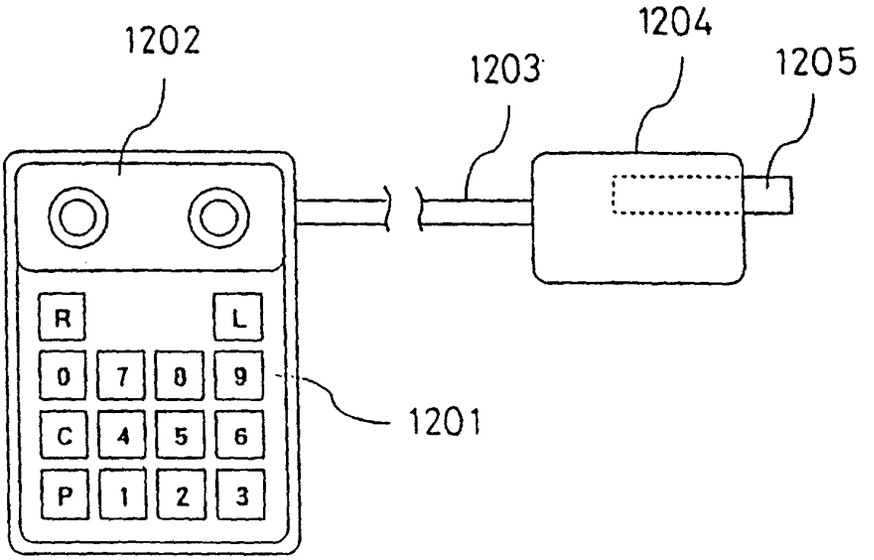


FIG. 13
PRIOR ART

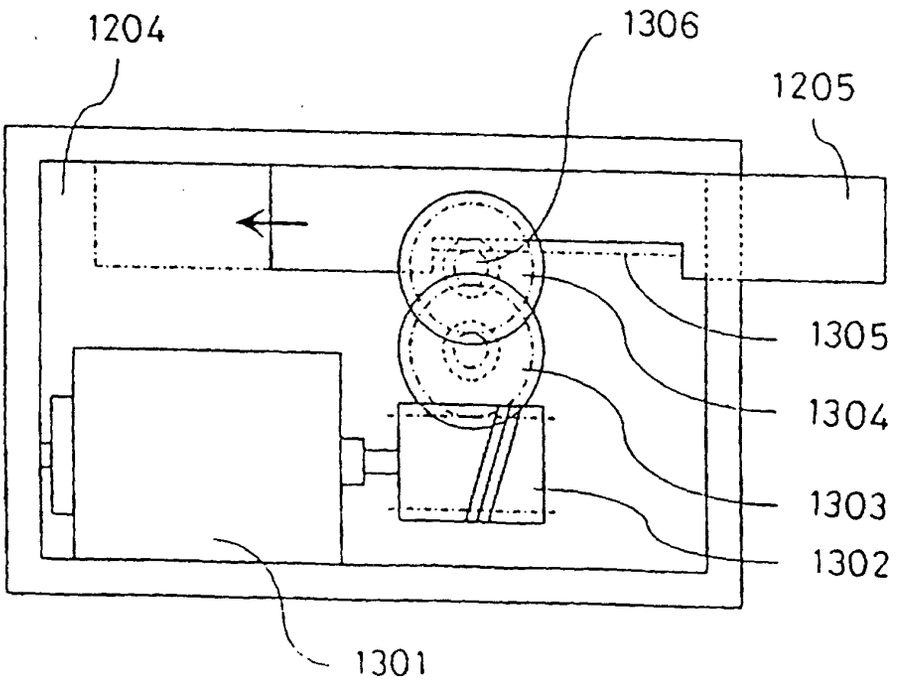


FIG. 14
PRIOR ART

