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Locking method for an electronic device and electronic device locking apparatus

Abstract

A locking method for an electronic device includes steps of: (a) adjusting working stages of an electronic device locking apparatus according to a size of an anti-theft hole of an electronic device; (b) inserting a fixing member into the anti-theft hole; and (c) switching a lock to a locking state, such that the electronic device locking apparatus and the electronic device are inseparable. Movements of the working stages and the fixing member are separate. The working stages can be adjusted in advance, and then the fixing member is inserted into and is unfolded to engage in the anti-theft hole. When unlocking, just folding the fixing member and then the fixing member can leave the anti-theft hole. The fixing member can be used to engage in the anti-theft hole of the same size, directly without changing the working stage, which is convenient to use.

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Background/Summary

BACKGROUND OF THE INVENTION

1. Field of the Invention

(1) The present invention relates to a locking method for an electronic device, especially to a locking method for a laptop computer.

2. Description of the Prior Art(s)

(2) A conventional electronic device, especially a portable electronic device such as a laptop

computer, usually has an anti-theft hole that is used along with a specific lock such as a laptop lock, so as to lock the laptop computer at a specific location and prevent the laptop computer from being stolen.

(3) Anti-theft holes of conventional laptop computers are available in at least three different widths. Accordingly, manufacturers also develop multi-stage adjustable locks that can be adjusted to a proper stage, so as to be locked in the anti-theft hole of the conventional laptop computer.

(4) A conventional multi-stage adjustable lock, regardless of stepped type (such as three-stage typed) or stepless type, is inserted into the anti-theft hole of the laptop computer with two hooks when in use, and then working stage of the conventional multi-stage adjustable lock is switched (such as by turning a knob) to unfold the two hooks to engage in the anti-theft hole. Afterwards, depending on type of the combinational multi-stage adjustable lock, by pulling out a key from a key lock or scrambling sequence of numbers of a combination lock, the two hooks are unable to be folded and leave the anti-theft hole.

(5) However, when unlocking the conventional multi-stage adjustable lock by inserting the key or arranging the numbers in a correct sequence, the working stage has to be adjusted reversely (such as turning the knob in a reverse direction) to fold the two hooks to a minimum angle, such that the multi-stage adjustable lock can be separated front the laptop computer. The problem is, when connecting to the laptop computer next time, the working stage has to be switched again to fit the anti-theft hole. Even if the conventional multi-stage adjustable lock is connected to the same laptop computer having the same size of the anti-theft hole in most instances, the working stage has to be switched every time when the conventional multi-stage adjustable lock is reconnected to the laptop computer, which is inconvenient for use.

(6) To overcome the shortcomings, the present invention provides a locking method for an electronic device and art electronic device locking apparatus to mitigate or obviate the aforementioned problems.

SUMMARY OF THE INVENTION

(7) The main objective of the present invention is to provide a locking method for an electronic device, and the locking method includes steps of: (a) adjusting working stages of an electronic device locking apparatus according to a size of an anti-theft hole of an electronic device; (b) inserting a fixing member of the electronic device locking apparatus into the anti-theft hole of the electronic device; and (c) switching a lock of the electronic device locking apparatus to a locking state, so as to fix the fixing member of the electronic device locking apparatus to engage in the anti-theft hole of the electronic device with a selected one of the working stages, such that the electronic device locking apparatus and the electronic device are inseparable.

(8) The main objective of the present invention, is to provide an electronic device locking apparatus that is configured to secure an electronic device with an anti-theft hole. The electronic device locking apparatus has a fixing member, a stage adjusting mechanism, a driving mechanism, and a lock. The fixing member is configured to be inserted in the anti-theft hole of the electronic device. The stage adjusting mechanism is configured to adjust the electronic device locking apparatus to multiple working stages. The driving mechanism is connected with the fixing member and the stage adjusting mechanism and selectively unfolds the fixing member to engage in the anti-theft hole based on a current one of the working stages to which the stage adjusting mechanism adjusts. When the lock is locked, the stage adjusting mechanism is fixed at the current one of the working stages by the lock.

(9) In the electronic device locking apparatus of the present invention, adjustment of the working stages (including stepped or stepless form) and operation of the fixing member (such as unfolding two hooks) are separate. In other words, movements (unfolding or folding) of the fixing member do not interfere in the working stages to which the stage adjusting mechanism adjusts. Therefore, the stage adjusting mechanism can be adjusted to a proper one of the working stages in advance, and then the fixing member is inserted into and is unfolded to engage in the anti-theft hole. When

unlocking, just folding the fixing member and then the fixing member can leave the anti-theft hole. Since the working stage does not have to be changed, the fixing member can be used to engage in the anti-theft hole of the same size directly in the future. The working stage do not have to be adjusted, which is convenient to use.
(10) Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a perspective view of a first embodiment of an electronic device locking apparatus in accordance with the present invention;
(2) FIG. **2** is an exploded perspective view of the first embodiment of the electronic device locking apparatus in FIG. **1**;
(3) FIGS. **3** and **4** are partial exploded perspective views of the first embodiment of the electronic device locking apparatus in FIG. **1**;
(4) FIGS. **5** to **7** are operational cross-sectional top views of the first embodiment of the electronic device locking apparatus in FIG. **1**;
(5) FIGS. **8** and **9** are operational cross-sectional side views of the first embodiment of the electronic device locking apparatus in FIG. **1**;
(6) FIG. **10** is a cross-sectional end view of the first embodiment of the electronic device locking apparatus in FIG. **1**;
(7) FIG. **11** is a perspective view of a second embodiment of an electronic device locking apparatus in accordance with the present invention;
(8) FIGS. **12** and **13** are partial exploded perspective views of the second embodiment of the electronic device locking apparatus in FIG. **11**;
(9) FIGS. **14** to **16** are operational cross-sectional top views of the second embodiment of the electronic device locking apparatus in FIG. **11**;
(10) FIGS. **17** and **18** are operational cross-sectional side views of the second embodiment of the electronic device locking apparatus in FIG. **11**;
(11) FIG. **19** is a perspective view of a third embodiment of an electronic device locking apparatus in accordance with the present invention;
(12) FIGS. **20** and **21** are partial exploded perspective views of the third embodiment of the electronic device locking apparatus in FIG. **19**;
(13) FIGS. **22** and **23** are operational cross-sectional side views of the third embodiment of the electronic device locking apparatus in FIG. **19**;
(14) FIG. **24** is a perspective view of a fourth embodiment of an electronic device locking apparatus in accordance with the present invention;
(15) FIGS. **25** and **26** are partial exploded perspective views of the fourth embodiment of the electronic device locking apparatus in FIG. **24**;
(16) FIGS. **27** to **29** are operational cross-sectional side views of the fourth embodiment of the electronic device locking apparatus in FIG. **24**;
(17) FIGS. **30** and **31** are operational cross-sectional end views of the fourth embodiment of the electronic device locking apparatus in FIG. **24**;
(18) FIG. **32** is a perspective view of a fifth embodiment of an electronic device locking apparatus in accordance with the present invention;
(19) FIGS. **33** and **34** are partial exploded perspective views of the fifth embodiment of the electronic device locking apparatus in FIG. **32**;

(20) FIGS. **35** to **37** are operational cross-sectional top views of the fifth embodiment of the electronic device locking apparatus in FIG. **32**;
(21) FIGS. **38** and **39** are operational cross-sectional side views of the fifth embodiment of the electronic device locking apparatus in FIG. **32**;
(22) FIG. **40** is a perspective view of a sixth embodiment of an electronic device locking apparatus in accordance with the present invention;
(23) FIGS. **41** and **42** are partial exploded perspective views of the sixth embodiment of the electronic device locking apparatus in FIG. **40**; and
(24) FIGS. **43** and **44** are operational cross-sectional side views of the sixth embodiment of the electronic device locking apparatus in FIG. **40**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

(25) A locking method for an electronic device in accordance with the present invention includes the following steps: (a) Adjusting working stages of an electronic device locking apparatus according to a size (such as a width) of an anti-theft hole of an electronic device; (b) Inserting a fixing member of the electronic device locking apparatus into the anti-theft hole of the electronic device, wherein the fixing member has a folding state for leaving the anti-theft hole and an unfolding state for engaging in the anti-theft hole, and the fixing member is in the folding state when being inserted into the anti-theft hole; (c) Switching a lock of the electronic device locking apparatus to a locking state, so as to fix the fixing member of the electronic device locking apparatus to engage in the anti-theft hole of the electronic device with a selected one of the working stages. Thus, the electronic device locking apparatus and the electronic device are inseparable (cannot depart from each other). The process of switching the fixing member from the folding state to the selected one of the working stage may or may not be related to switching the lock to the locking state. However, the lock in the locking state can ensure that the fixing member is unable to be switched to the other working stage or the folding state.
(26) Preferably, the electronic device is a portable electronic device. Specifically, the electronic device may be, but is not limited to, a laptop computer.
(27) With reference to FIGS. **1** and **2**, an electronic device locking apparatus in accordance with the present invention comprises a fixing member **10**, a stage adjusting mechanism **20**, a driving mechanism **30**, and a lock **40**.
(28) With reference to FIGS. **3** to **5** and **8**, the fixing member **10** is configured to be inserted in the anti-theft hole of the electronic device. In the preferred embodiments, the fixing member **10** includes two hooks **11** and a hook resilient element **12**. The two hooks **11** are pivotally connected with each other. The hook resilient element **12** connects the two hooks **11**, so as to unfold or fold the two hooks **11** in a normal state. However, a structure of the fixing member **10** is not limited to the structure as described above.
(29) The stage adjusting mechanism **20** is configured to adjust the electronic device locking apparatus to multiple working stages and may adjusts in stepped or stepless form. As shown in FIGS. **5** and **6**, in different working stages, the fixing member **10** is unfolded to different degrees, such that the fixing member **10** is available for engaging in the anti-theft holes of different sizes.
(30) The driving mechanism **30** is connected with the fixing member **10** and the stage adjusting mechanism **20** and selectively unfolds the fixing member **10** to engage in the anti-theft hole based on a current one of the working stages to which the stage adjusting mechanism **20** adjusts.
(31) When the lock **40** is locked, the stage adjusting mechanism **20** is fixed at the current one of the working stages b the lock **40** directly or indirectly. That is, the fixing member **10** is unable to be switched to other working stages or be folded.
(32) In the present invention, the stage adjusting mechanism **20** and the fixing member **10** act (such as unfolding the two hooks **11**) separately. In other words, movements (unfolding or folding) of the fixing member **10** do not interfere in the working stages to which the stage adjusting mechanism **20** adjusts. Therefore, the stage adjusting mechanism **20** can be adjusted to a proper one of the

working stages in advance, and then the fixing member **10** is inserted into and is unfolded to engage in the anti-theft hole. When unlocking, just folding the fixing member **10** and then the fixing member **10** can leave the anti-theft hole. Since the working stage does not have to be changed, the fixing member **10** can be used to engage in the anti-theft hole of the same size directly. The working stage do not have to be adjusted, which is convenient to use.

(33) The electronic device locking apparatus of the present invention has six embodiments as follows.

(34) With reference to FIGS. **1** to **10**, a first embodiment of the electronic device locking apparatus in accordance with the present invention is shown. With reference to FIGS. **3** to **5** and **8**, the driving mechanism **30** includes a central shaft **31**. The central shaft **31** is movable toward the fixing member **10** to unfold the fixing member **10** to engage the anti-theft hole based on a current one of the working stages to which the stage adjusting mechanism **20** adjusts. The central shall **31** is not limited to be shaped into a thin rod and may also be shaped in various shapes such as cylinder. The central shaft **31** may moves to directly push to unfold the fixing member **10**, or the central shaft **31** may push to unfold the fixing member **10** indirectly via other components. In the first embodiment, the driving mechanism **30** further includes a rotating member **32** disposed between the central shaft **31** and the fixing member **10** and connected with the stage adjusting mechanism **20**. The rotating member **32** is rotated to different angles based on the working stages to which the stage adjusting mechanism **20** adjusts, as shown in FIGS. **5** and **6**. In the first embodiment, the stage adjusting mechanism **20** is radially exposed to, but not necessarily protrudes to, an outside of a housing **60**, so as to allow a user to adjust the working stages. Preferably, the user can rotate the rotating member **32** indirectly through pulling the stage adjusting mechanism **20**. When the central shaft **31** is moved to the fixing member **10**, the central shaft **31** pushes the rotating member **32** to push to unfold the fixing member **10** to a corresponding one of the angles based on the current one of the working stages to which the stage adjusting mechanism **20** adjusts.

(35) Preferably, with reference to FIGS. **3** and **5**, the rotating member **32** is a sleeve and has an opening facing toward the fixing member **10** and mounted around an inner end portion of the fixing member **10**. The hook resilient element **12** of the fixing member **10** allows outer ends of the two hooks **11** that are pivotally connected with each other to be folded and inner ends of the two hooks **11** to be unfolded in the normal state. An interior of the rotating member **32** is formed to have different inner diameters, so as to prevent the inner ends of the two hooks **11** from being unfolded. When the rotating member **32** is rotated to the different angles, the interior of different inner diameters forces the inner ends of the two hooks **11** to be folded to different degrees of expansion and the outer ends of the two hooks **11** to be unfolded to different degrees of expansion, as shown in FIGS. **5** and **6**.

(36) A structure of the rotating member **32** is not limited to the structure as described above. The interior of the rotating member **32** may be cortical or the rotating member **32** may be conical. Thus, different axial positions of the rotating member **32** would decide the degrees of expansion of the two hooks **11**.

(37) With reference to FIGS. **3** to **5** and **8**, the stage adjusting mechanism **20** is movably and non-rotatably connected to the rotating member **32**. An end of the central shaft **31** is rotatably and non-movably connected to the rotating member **32**, such that the central shaft **31** is able to drive the rotating member **32** to move along an axial direction. The stage adjusting mechanism **20** and the central shaft **31** drive the rotating member **32** to rotate and move respectively and do not interfere with each other.

(38) Preferably, the central shaft **31** tends to move toward the fixing member **10**. Specifically, the driving mechanism **30** further includes a central shaft resilient element **33** pushing the central shaft **31**. In addition, with reference to FIGS. **4**, **6**, and **7**, the electronic device locking apparatus further comprises an unlocking member **50** connected with the central shaft **31** and selectively driving the central shaft **31** to move away from the fixing member **10**. The unlocking member **50** is exposed to

the outside of the housing **60**, so as to allow the user to indirectly pull the central shaft **31**. When the central shaft **31** is pulled back, the rotating member **32** also moves away from the fixing member **10**. Thus, the inner ends of the two hooks **11** are no longer covered by the rotating remember **32** and are unfolded by the hook resilient element **12**. Accordingly, the outer ends of the two hooks **11** are folded as shown in FIG. **7**. The fixing member **10** is in the folding state and is able to leave the anti-theft hole.

(39) In the first embodiment, the unlocking member **50** is a button that protrudes outwardly in a normal state. When the unlocking member **50** is pressed, the unlocking member **50** pushes the central shaft **31** to move away from the fixing member **10**. Preferably, one of the unlocking member **50** and the central shaft **31** has an inclined surface, such that the unlocking member **50** is able to push the central shaft **31** from different directions.

(40) Preferably, with reference to FIGS. **3**, **4**, **8**, and **9**, the lock **40** stops the central shaft **31** from moving away from the fixing member **10**. That is, the lock **40** stops the fixing member **10** from being switched to the folding state. The lock **40** has an engaging member **41** (such as a locking bar) protruding toward the central shaft **31** in a normal state. When the lock **40** is unlocked, the engaging member **41** is retractable. Thus, the user can pull the central shaft **31** through the unlocking member **50**. Moreover, when the central shaft **31** is moved, the central shaft **31** would push the engaging member **41** to retract, as shown in FIG. **9**. However, when the lock **40** is locked, the engaging member **41** is unable to retract, so as to prevent the central shaft **31** from moving away from the fixing member **10**. Accordingly, the fixing member **10** is unable to be switched to the folding state, as shown in FIG. **8**.

(41) Furthermore, with reference to FIGS. **3**, **5**, and **10**, the rotating member **32** has an engaging portion **321**. The engaging portion **321** of the rotating member **32** is formed on an outer side surface of the rotating member **32** and selectively engages with multiple engaging portions **61** that are formed on an inner side surface of the housing **60**. Preferably, the engaging portion **321** of the rotating member **32** may be formed as a protrusion and each of the engaging portions **61** of the housing **60** may be formed as a recess. When the central shaft **31** pushes the rotating member **32** to be mounted around the fixing member **10**, the engaging portion **321** of the rotating member **32** engages with the engaging portions **61** of the housing **60**, as shown in FIG. **10**, such that the rotating member **32** is unable to rotate. When the rotating member **32** moves away from fixing member **10**, the rotating member **32** disengages from the engaging portions **61** of the housing **60**, such that the rotating member **32** is rotatable to switch the working stages. Thus, when the lock **40** is locked, the rotating member is unable to move to disengage from the engaging portions **61** of the housing **60**. It can ensure that the fixing member **10** is unable to be switched to other working stages.

(42) By adjusting the working stages (flipping the stage adjusting mechanism **20** to rotate the rotating member **32**) and driving the fixing member **10** (the central shaft **31** pushing the rotating member **32** and the unlocking member **50** pulling the rotating member **32** back) separately, the working stages can be adjusted in advance. Then the fixing member **10** is inserted into the anti-theft hole and is unfolded to engage in the anti-theft hole. When unlocking, the fixing member **10** can be folded to leave the anti-theft hole just by pulling the unlocking member **50**. Since the working stage is not changed, the fixing member **10** can be used to engage in the other anti-theft bole having the same size. During operation, the unlocking member **50** is pulled to fold the fixing member **10** and then the unlocking member **50** is released after the fixing member **10** is inserted into the anti-theft hole. Afterwards, the central shaft **31** pushes the rotating member **32** again to unfold the fixing member **10**. The working stages do not have to be changed, which allows convenient use of the electronic device locking apparatus.

(43) With reference to FIGS. **11** to **18**, a second embodiment of the electronic device locking apparatus is shown and is similar to the firs embodiment. The main differences therebetween are as follows.

(44) First, with reference to FIGS. **12** to **14** and **17**, the central shaft **31** and the rotating member **32** are fixed together and can be regarded as a single part. Consequently, the central shaft **31** and the rotating member **32** rotate simultaneously. The central shaft **31** has multiple rotating-stopping portions **311** formed on the central shaft **31** and corresponding in position to the engaging member **41** of the lock **40**. Each of the rotating-stopping portions **311** of the central shaft **31** is preferably formed as a recess. With reference to FIGS. **12**, **17**, and **18**, when the lock **40** is locked, the engaging member **41** is non-retractable. Except for stopping the central shaft **31** from moving away from the fixing member **10**, the engaging member **41** also works along with one of the rotating-stopping portions **311** of the central shaft **31** to stop the central shaft **31** and the rotating member **32** from rotating. Thus, the fixing member **10** is unable to be switched to the other working stages and is unable to be retracted.
(45) Second, with reference to FIGS. **13**, **14**, and **17**, the stage adjusting mechanism **20** is radially exposed to the outside of the housing **60** from an end of the housing **60** as shown in FIG. **17**, so as to allow the user to adjust the working stages. Preferably, it needs a tool, such as a flat-bladed screwdriver, to rotate the stage adjusting mechanism **20** and the stage adjusting mechanism **20** cannot be rotated manually, so as to prevent the working stages from being adjusted easily or accidentally. The stage adjusting mechanism **20** is axially mounted through the central shaft **31** and the rotating member **32** movably but non-rotatably.
(46) Third, with reference to FIGS. **11**, **15**, and **16**, the button, which is radially protrudes out of the housing **60**, of the unlocking member **50** pulls the unlocking member **50** to move away from member **10** when unlocking. Accordingly, the central shaft **31** and the rotating member **32** are moved away from the fixing member **10** simultaneously. In the second embodiment, since the central shaft **31** and the rotating member **32** are formed as a single part, it can be regarded that the unlocking member **50** is connected with the rotating member **32** and drives the rotating member **32** directly.
(47) In the second embodiment, the objective of the present invention can also be achieved b adjusting the working stages (rotating the stage adjusting mechanism **20** with a tool to rotate the central shaft **31** and the rotating member **32**) and driving the fixing member **10** (the central shaft **31** pushing the rotating member **32** and pulling the unlocking member **50** to pull the rotating member **32** back) separately.
(48) With reference to FIGS. **19** to **23**, a third embodiment of the electronic device locking, apparatus is shown and is similar to the first embodiment. The main differences therebetween are as follows.
(49) The central shaft **31** in the third embodiment may be regarded as part of the lock **40**. The central shaft **31** axially protrudes out of two ends of the lock **40**, as shown in FIG. **22**. When unlocking, the central shaft **31** is away from the fixing member **10** to protrude out of the lock **40**, as shown in FIG. **22**. When locking, just directly press the central shaft **31** toward the fixing member **10**, then the lock **40** is switched to the locking state following movement of the central shaft **31**, and the central shaft **31** is fixed at a position for pushing the rotating member **32** as shown in FIG. **23**. When unlocked, such as axially inserting a key into the lock **40** and turning the key, the central shaft **31** rebounds and pulls the rotating member **32** away from the fixing member **10** as shown in FIG. **22**. Thus, there is no unlocking member **50** in the third embodiment, the lock **40** performs the unlocking function instead.
(50) With reference to FIG. **20**, in the third embodiment, the engaging portion **321** on the outer side surface of the rotating member **32** and the engaging portions **61** on the inner side surface of the housing **60** are also used to stop the rotating member **32** from rotating. The third embodiment of the electronic device locking apparatus operates in the same way as the first embodiment of the electronic device locking apparatus, and thus a further description of the third embodiment is omitted.
(51) The lock **40** in the first embodiment is a combination lock and the lock in the third

embodiment is a key lock.
(52) In the third embodiment, the objective of the present invention also can be achieved by adjusting, the working stages (flipping the stage adjusting mechanism **20** to rotate the rotating member **32**) and driving the fixing member **10** (the central shaft **31** pushing the rotating member **32** and the lock **40** to pull the central shaft **31** and the rotating member **32** back) separately.
(53) With reference to FIGS. **24** to **31**, a fourth embodiment of the electronic device locking apparatus is shown and is similar to the second embodiment. The main differences therebetween are as follows.
(54) With reference to FIGS. **25** to **27**, the central shaft **31** in the fourth embodiment tends to move away from the fixing member **10**. Specifically, a position and a pushing direction of the central shaft resilient element **33** is changed. The electronic device locking apparatus further comprises a stop member **70** tending to abut against the central shaft **31**. When the central shaft **31** moves toward the fixing member **10** to unfold the fixing member **10**, the stop member **70** stops the central shaft **31** from moving away from the fixing member **10**. Preferably, the stop member **70** includes a pin **71** and a pin resilient element **72**. The pin resilient element **72** pushes the pin **71** to abut against the central shaft **31**.
(55) The aforementioned configuration is only a different way to control an axial position of the central shaft **31**. Therefore, the central shaft **31** having the aforementioned configuration can also be used along with the rotating member **32**. However, the central shaft **31** in the fourth embodiment is modified to directly push the fixing member **10** without working with the rotating member **32**. In this situation, the hook resilient element of the fixing member **10** drives the two hooks **11** that are pivotally connected with each other to fold the inner ends of the two hooks **11** and to unfold the outer ends of the two hooks **11** in the normal state. With reference to FIGS. **27** and **28**, the closer the central shaft **31** to the inner ends of the two hooks **11**, the more open the inner ends of the two hooks **11** is and the more open the outer ends of the two hooks **11** is.
(56) Furthermore, with reference to FIGS. **25** to **28**, the stage adjusting mechanism **20** rotates the central shaft **31** when adjusting the working stages. When the central shaft **31** moves toward the fixing member **10** to unfold the fixing member **10**, the stop member **70** stops the central shaft **31** at different axial positions according to different angles of the central shaft **31**. Preferably, the central shaft **31** has multiple stop recesses **312** formed on an outer side surface of the central shaft **31** and arranged at different angular positions. Each of the stop recesses **312** extends toward the fixing member **10** and the stop recesses **312** have different extended depths. That is, axial distances between each of the stop recesses **312** and the fixing member **10** are different. Thus, when the central shaft **31** is pushed to move toward the fixing member **10** (preferably, the user pushes the end, which protrudes out from the stage adjusting mechanism **20**, of the central shaft **31**), the stop member **70** moves along the outer side surface of the central shaft **31** and protrudes into one of the stop recesses **312**. When force applied to the central shaft **31** stops, the central shaft **31** tends to move away from the fixing member **10** until the stop member **70** abuts against a sidewall defined in a corresponding one of the stop recesses **312** to stop the central shaft **31** from keeping moving away from the fixing member **10**. Since the stop recesses **312** has said different extended depths, the stop member **70** can abut against the sidewall defined in a different one of the stop recesses **312** by rotating the central shaft **31**. Consequently, the central shaft **31** would stop at said different angular positions.
(57) With reference to FIGS. **28** to **31**, when unlocking, just slightly rotating the central shaft **31** through the stage adjusting mechanism **20** as shown in FIG. **31** and moving the stop member **70** out of the corresponding one of the stop recesses, the central shaft **31** without support of the stop member **70** continues to move away from the fixing member **10** immediately, so as to restore the fixing member **10** to the folding state. Thus, there is no unlocking member **50** in the fourth embodiment, the stage adjusting mechanism **20**, the stop member **70** and the stop recesses **312** perform the unlocking function instead.

(58) In addition the lock **40** in the fourth embodiment is similar to the lock **40** in the second embodiment. The rotating-stopping portions **311** in the second embodiment are formed on the central shaft **31**. With reference to FIGS. **25** to **27**, the rotating-stopping portions **21**, which are preferably formed as recesses, in the fourth embodiment are formed on the stage adjusting mechanism **20** and also corresponds in position to the engaging member **41** of the lock **40**. When the lock **40** is locked, the engaging member **41** is non-retractable, such that the engaging member **41** in the stage adjusting mechanism **20** works along with the rotating-stopping portion **21** in the stage adjusting mechanism **20** to stop the stage adjusting mechanism **20** and the central shaft **31** from rotating. Thus, the stop member **70** is unable to leave the corresponding one of the stop recesses **312**, and the fixing member **10** is unable to be switched to the other working stages and is unable to be retracted.
(59) Moreover, the electronic device locking apparatus further comprises a positioning member **80** tending to abut against the stage adjusting mechanism **20** (or the central shaft **31**), such that the central shaft **31** tends to be positioned at a specific rotating angle. Preferably, the stage adjusting mechanism **20** (or the central shaft **31**) has multiple positioning portions **22**, each of which is preferably formed as a recess, for working along with the positioning member **80**. The positioning member **80** fixes the central shaft **31** to the stop member **70** at multiple angular positions that corresponding in position to the stop recesses **312** respectively, so as to ensure that the stop member **70** can be inserted into the corresponding one of the stop recesses **312**. In addition, when unlocking and slightly rotating the central shaft **31**, by releasing the central shaft **31**, the positioning member **80** also forces the stage adjusting mechanism **20** and the central shaft **31** to rotate back to allow the stop member **70** to face the corresponding one of the stop recesses **312**, for ease of use.
(60) Lastly, with reference to FIGS. **24** and **25**, the stage adjusting mechanism **20** is radially exposed to the outside of the housing **60** from the end of the housing **60** like the stage adjusting mechanism **20** in the second embodiment. The difference is that the stage adjusting mechanism **20** in the fourth embodiment is modified to be formed as a turning knob for manually turning.
(61) In the fourth embodiment, the objective of the present invention can be achieved by adjusting the working stages (rotating the central shaft **31** to allow the stop member **70** to corresponding in position to one of the stop recess **312**) and driving the fixing member **10** (pushing the central shaft **31** to move the fixing member **10** and slightly rotating the central shaft **31** to allow the central shaft **31** to rebound) separately.
(62) With reference to FIGS. **32** to **39**, a fifth embodiment of the electronic device locking apparatus is shown and is similar to the fourth embodiment. The main differences therebetween are as follows.
(63) First, the stage adjusting mechanism **20** rotates the central shaft **31** in both fifth and fourth embodiments. However, in the fourth embodiment, the axial position of the central shaft **31** is controlled by pressing the central shaft **31** and the cooperation of the stop member **70**, the stop recesses **312** and the central shaft resilient element **33**. With reference to FIGS. **33** to **36**, the central shaft **31** in the fifth element is screwed to the unlocking member **50** and the axial position of the central shaft **31** (i.e. the position relative to the unlocking member **50**) is changed by rotating the central shaft **31**.
(64) Moreover, the working stages in the first four embodiments are adjusted in the stepped form (such as three-stage), and in the fifth and six embodiments, the expansion degree of the fixing member **10** are adjusted by changing the axial position of the central shaft **31** through screwing. Therefore, the working stages in the fifth and sixth, embodiments are adjusted in the stepless form.
(65) Second, there is no unlocking member **50** in the fourth embodiment and the stage adjusting mechanism **20** is unlocked by slightly rotating the central shaft **31**. With reference to FIGS. **33**, **34**, **36**, and **37**, with the unlocking member **50** in the fifth embodiment, the unlocking member **20** directly drives (through threads) the central shaft **31** to move away from the fixing member **10** together. By releasing the unlocking member **50**, the central shaft resilient element **33** also pushes

the central shaft **31** and the unlocking member **50** back. In addition, the unlocking member **50** in the fifth embodiment is radially exposed to the outside of the housing **60** for the user to pull, as shown in FIG. **32**.

(66) Third, with reference to FIGS. **33**, **38**, and **39**, the lock **40** is similar to the lock **40** in the second embodiment. When the lock **40** is locked, the engaging member **41** is non-retractable. For the time being, part of the engaging member **41** stops the unlocking member (or the central shaft **31**) from moving away from the fixing member **10**, so as to prevent the unlocking member **50** from driving the central shaft **31** to move away from the fixing member **10**. Accordingly, the fixing member **10** is unable to be changed to the folding state. Moreover, the other part of the engaging member **41** works along with the rotating-stopping portion **21** of the stage adjusting mechanism **20** to stop the stage adjusting mechanism **20** and the central shaft **31** from rotating. Accordingly, the central shaft **31** that is connected with the unlocking member **50** through threads is unable to rotate relative to the unlocking member **50**. Thus, the central shaft **31** is unable to be moved and the fixing member **10** is unable to be switched to the other working stages. In addition, when the lock **40** is unlocked and the engaging member **41** is retractable, the engaging member **41** and the rotating-stopping portions **21** of the stage adjusting mechanism **20** can function like the positioning member **80** in the fourth embodiment and fix the central shaft **31** at a specific rotating angle. Thus, the working stage that is adjusted in the stepless form in the fifth embodiment can also be adjusted in the stepped from.

(67) Furthermore, preferably, in an unlocking state, when the central shaft **31** is pulled back by the unlocking member **50** to a certain extent, the engaging member **41** engages in a back engaging recess **51** of the unlocking member **50**. For the time being, if the lock **40** is switched to the locking state and the engaging member **41** is unable to be retracted, the central shaft **31** and the unlocking member **50** would stay at the position that is away from the fixing member **10** and the fixing member **10** would remain folded.

(68) In the fifth embodiment, the objective of the present invention can be achieved by adjusting the working stages (rotating the central shaft **31** to change the position of the central shaft **31**) and driving the fixing member **10** (the central shaft **31** pushing the fixing member **10** and the unlocking member **50** to pull the central shaft **31** back) separately.

(69) With reference to FIGS. **40** to **44**, the sixth embodiment of the electronic device locking apparatus is shown and is similar to the fifth embodiment. The main differences therebetween are as follows.

(70) First, the lock **40** in the fifth embodiment is a combination lock and the lock **40** in the six embodiment is a key lock.

(71) Second, in the fifth embodiment, the engaging member **41** stops the unlocking member **50** (or the central shaft **31**) from moving away from the fixing member **10** and stops the stage adjusting mechanism **20** (or the central shaft **31**) from rotating with two different parts of the engaging member **41**. However, in the sixth embodiment, with reference to FIGS. **42** to **44**, the engaging member **41** of the lock **40** stops the unlocking member **50** (or the central shaft **31**) from moving away from the fixing member **10** and stops the stage adjusting mechanism **20** (or the central shaft **31**) from rotating with the same part of the lock **40**.

(72) Third, in the sixth embodiment, there is the positioning member **80** to fix the angle of the central shaft **31**.

(73) Thus, in the sixth embodiment, the objective of the present invention can be achieved by adjusting the working stages (rotating the central shaft **31** to change the position of the central shaft **31**) and driving the fixing member **10** (the central shaft **31** pushing the fixing member **10** and the unlocking member **50** pulling the central shaft **31** back) separately.

(74) The electronic device locking apparatus of the present invention is not limited to the aforementioned six embodiments, and the essential elements in the six embodiments are exchangeable. For instance, the combination lock and the key lock are exchangeable.

(75) The locking method for the electronic device of the present invention with the aforementioned six embodiments is described as follows.
(76) At first, the basic concept of the locking method is described along with the third and fourth embodiments. At the beginning, the central shaft **31** has not abutted against or unfolded the fixing member **10**, and the working stage is adjusted through the stage adjusting mechanism **20** based on the size of the anti-theft hole (by rotating the rotating member **32** in the third embodiment and by rotating the central shaft **31** in the fourth embodiment). Then the fixing member **10** is inserted into the anti-theft hole. For the time being, the fixing member **10** is still folded. Then the central shaft **31** is pressed to unfold the fixing member **10** according to the selected one of the working stages and the lock **40** is switched to the locking state to fix the fixing member **10**. Thus, the fixing member **10** engages in the anti-theft hole and the electronic device locking apparatus and the electronic device are inseparable.
(77) In the other four embodiments, the fixing member **10** is folded through the unlocking member **50** and is inserted into the anti-theft hole. Then the unlocking member is released to unfold the fixing member **10** according to the selected one of the working stages. Lastly, switch the lock **40** to the locking state.
(78) The locking method for the electronic device of the present invention can also have many variations and is described along with the aforementioned six embodiments as follows.
(79) When the fixing member **10** of the electronic device is inserted into the anti-theft hole, by moving the central shaft **31** of the electronic device locking apparatus toward the fixing member **10**, the fixing member **10** would engage in the anti-theft hole based on the selected one of the working stages as the six embodiments described above. However, the electronic device locking apparatus and the locking method, of the present invention are not limited to have the central shaft **31**. In addition, moving of the central shaft **31** toward the fixing member **10** may be manually operated or automatically driven by an internal structure such as the central shaft resilient element **33**.
(80) Furthermore, when the central shaft **31** is moving toward the fixing member **10**, the central shaft **31** may directly push the fixing member **10** to unfold the fixing member **10** and the central shaft **31** would be moved to the different axial positions (the different extended depths) according to the selected one of the working stages, as shown in the fourth, fifth and the sixth embodiments. However, it can also be modified to that the central shaft **31** pushes the rotating member **32** and the rotating member **32** pushes the fixing member **10** to unfold the fixing member **10**. The rotating member **32** would be rotated to the different angles according to the selected one of the working stages to push the fixing member **10**, as shown in the first, second and third embodiments.
(81) In addition, the central shaft **31** may tend to move toward the fixing member **10**. However, the fixing member **10** is inserted into the anti-theft hole after the user pushes the central shaft **31** to move away from the fixing member **10** (which is operated through the unlocking member **50** in the first, second, fifth and sixth embodiments). Then the central shaft **31** is released (by releasing the unlocking member **50** in the first, second, fifth, and sixth embodiment) to allow the central shaft **31** to move toward the fixing member **10**, such that the fixing member **10** can be unfolded according to the selected one of the working stages and engages in the anti-theft hole.
(82) However, in the other embodiments, the central shaft **31** is also possible not to move toward the fixing member **10**. The central shaft **31** is moved toward, the fixing remember **10** (by pressing the central shaft **31** in the third and fourth embodiments) after the fixing member **10** is inserted into the anti-theft bole, such that the fixing member **10** can be unfolded according to the selected one of the working stages and engages in the anti-theft hole.
(83) Furthermore, the central shaft **31** may also tend w move away the fixing member **10**. When the user moves the central shaft **31** toward the fixing member **10**, the stop member **70** stops the central shaft **31** from moving away from the fixing member **10**, so as to fix the central shaft **31** at a specific axial position, as shown in the fourth embodiment. In addition, the lock **40** in the third embodiment

may also be regarded as having the stop member **70** to stop the central shaft **31** from moving away from the fixing member **10**.
(84) At last, when there is the stop member **70**, the working stage is adjusted by rotating the central shaft **31** When the user moves the central shaft **31** toward the fixing member **10**, the stop member **70** stops the central shaft **31** at the different axial positions according the different angles of the central shaft **31**, like the stop recesses **312** that are disposed at different angular positions as shown in the fourth embodiment.
(85) Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and features of the invention, the disclosure is illustrative only. Changes may be made in the details, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

Claims

1. A locking method for an electronic device, the locking method comprising: (a) adjusting working stages of an electronic device locking apparatus according to a size of an anti-theft hole of an electronic device; (b) inserting a fixing member of the electronic device locking apparatus into the anti-theft hole of the electronic device; and (c) switching a lock of the electronic device locking apparatus to a locking state, so as to fix the fixing member of the electronic device locking apparatus to engage in the anti-theft hole of the electronic device with a selected one of the working stages, such that the electronic device locking apparatus and the electronic device are inseparable, wherein, after inserting the fixing member of the electronic device locking apparatus into the anti-theft hole of the electronic device, a central shaft of the electronic device locking apparatus is moved toward the fixing member to unfold the fixing member to engage in the anti-theft hole with the selected one of the working stages, and wherein, when the central shaft of the electronic device locking apparatus moves toward the fixing member, the central shaft pushes a rotating member to make the rotating member push to unfold the fixing member, and the rotating member is rotated to different angles according to the selected one of the working stages to push the fixing member.
2. The locking method for the electronic device as claimed in claim 1, wherein the central shaft of the electronic device locking apparatus is biased to move toward the fixing member; the fixing member of the electronic device locking apparatus is inserted into the anti-theft hole of the electronic device after the central shaft is moved away from the fixing member by a user; and when the central shaft is released by the user, the central shaft moves toward the fixing member to unfold the fixing member to engage in the anti-theft hole with the selected one of the working stages.
3. An electronic device locking apparatus configured to secure an electronic device that has an anti-theft hole, the electronic device locking apparatus comprising: a fixing member configured to be inserted in the anti-theft hole of the electronic device; a stage adjusting mechanism configured to adjust the electronic device locking apparatus to multiple working stages; a driving mechanism connected with the fixing member and the stage adjusting mechanism and selectively unfolding the fixing member to engage in the anti-theft hole based on one of the multiple working stages currently selected to which the stage adjusting mechanism adjusts, the driving mechanism including: a central shaft, and a rotating member disposed between the central shaft and the fixing member and connected with the stage adjusting mechanism, the rotating member being rotated to different angles based on the working stages to which the stage adjusting mechanism adjusts; and a lock, wherein, when the lock is in a locking state, the stage adjusting mechanism is fixed at the current one of the working stages by the lock, and wherein, when the central shaft is moved to the fixing member: the fixing member is unfolded to engage in the anti-theft hole based on the current

one of the working stages to which the stage adjusting mechanism adjusts, and the central shaft pushes the rotating member to push to unfold the fixing member to a corresponding one of the angles based on the current one of the working stages to which the stage adjusting mechanism adjusts.

4. The electronic device locking apparatus as claimed in claim 3, wherein the central shaft is biased to move toward the fixing member; and the electronic device locking apparatus further comprises an unlocking member connected with the central shaft and selectively driving the central shaft to move away from the fixing member.