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(54) Title: HINGE LOCKS WITH LOCK BRACKETS

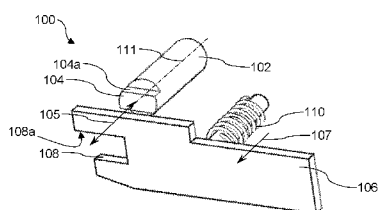


Fig. 1A

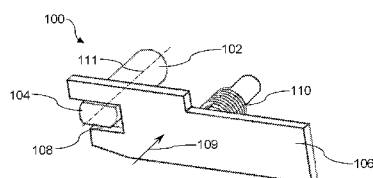


Fig. 1B

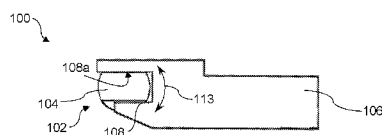


Fig. 1C

(57) Abstract: In an example, a hinge lock may include a hinge shaft having a lock feature. Further, the hinge lock may include a lock bracket having a lock slot to slidably receive the lock feature. The lock slot may receive the lock feature so as to engage the lock bracket with the hinge shaft. Yet further, the hinge lock may also include a bias member to urge the lock bracket in a direction away from the lock feature of the hinge shaft.



HINGE LOCKS WITH LOCK BRACKETS

BACKGROUND

[0001] Electronic devices such as computing devices may come in a variety of form factors dependent on individual preferences and needs. Some electronic devices, for example, personal computers (PC's), desktop computers, or workstations, may have a housing for the computing device and a separate, standalone housing for the display. Other electronic devices may have a more integrated form factor, where the computing device and the display and/or user interface are a single device. Such integrated electronic devices may include notebook or laptop computers, or other devices having a clamshell-style form factor.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0002]** Fig. 1A is a perspective view of example hinge lock.
- [0003]** Fig. 1B is another perspective view of the example hinge lock of Fig. 1A.
- [0004]** Fig. 1C is a front view of the example hinge lock of Fig. 1A.
- [0005]** Fig. 2A is a perspective view of an example electronic device having an example hinge lock.
- [0006]** Fig. 2B is a detail perspective view of the example electronic device of Fig. 2A.
- [0007]** Fig. 2C is another detail perspective view of the example electronic device of Fig. 2A.
- [0008]** Fig. 3A is a perspective view of another example electronic device having an example hinge lock.
- [0009]** Fig. 3B is a detail perspective view of the example electronic device of Fig. 3A.
- [0010]** Fig. 3C is another detail perspective view of the example electronic device of Fig. 3A.
- [0011]** Fig. 3D is another perspective view of the example electronic device of Fig. 3A.

DETAILED DESCRIPTION

[0012] Electronic devices such as computing devices may come in a variety of form factors dependent on individual preferences or needs. Some electronic devices, for example, personal computers (PC's), desktop computers, or workstations, may have a housing for the computing device and a separate, standalone housing for the display. Other electronic devices may have a more integrated form factor, wherein the computing device and the display and/or user interface are a single device. Such integrated electronic devices may include notebook computers, laptop computers, or other devices having a clamshell-style form factor. A clamshell or clamshell-style form factor may refer to a device with the ability to fold apart into an open position for use, and to fold against itself again into a closed position when not in use. In some situations, such clamshell devices like notebook computers and laptops may include a first housing and a second housing connected together by a hinge to enable such movement. Additionally, such electronic devices may be of a portable nature, due to their integrated form factor.

[0013] Clamshell electronic devices may be carried around to different places and/or through public due to their portability. Thus, in some situations, it may be desirable to be able to secure such clamshell electronic devices to a particular location since their portable nature may make them more susceptible to nefarious acts such as theft. Thus, some electronic devices include a feature designed to be used with a security device or external device lock such as a cable lock, wherein the cable lock can be wrapped around a secure element like a table leg to prevent theft of the electronic device.

[0014] In some additional situations, even though the electronic device may be physically secured to an object, if the user is away from the device, it may be possible for another person to open the display of the electronic device and see the contents on the display. Thus, it may be desirable to be able to prevent the clamshell electronic device from being opened if desired. Implementations of the present disclosure provide hinge locks for electronic devices that can lock the electronic device in the closed position and prevent unauthorized people from being able to access content on the display of the electronic device. Further, implementations of the present disclosure provide hinge locks which may be used in conjunction with an external device lock. External device locks may be able to physically secure an electronic device to a particular object or location, and, when used with an example hinge lock as disclosed herein, the use of the

external device lock may also cause the hinge lock to physically lock the electronic device in the closed position.

[0015] Referring now to Fig. 1A, a perspective view of an example hinge lock 100 is illustrated. Hinge lock 100 may include a hinge shaft 102 having a lock feature 104. Further, hinge lock 100 may include a lock bracket 106 having a lock slot 108 to slidably receive the lock feature 104. The lock slot 108 may receive the lock feature 104 so as to engage the lock bracket 106 with the hinge shaft 102. Yet further, the hinge lock 100 may also include a bias member 110 to urge the lock bracket 106 in a direction, e.g., direction 107, away from the lock feature 104 of the hinge shaft 102.

[0016] The hinge shaft 102 may be a rotating component of or attached to a hinge of an electronic device, in some implementations. The hinge shaft 102 may be rounded or substantially cylindrical or tubular, and/or may be a pin, post, barrel, rod, or other suitable rotatable component. As such, the hinge shaft 102 may have a central or longitudinal axis, e.g., central axis 111, about which the hinge shaft 102 may be able to rotate. In some examples, the lock feature 104 may be a boss, tab, post, block, or other type of protrusion, and may extend from the hinge shaft 102, or an end thereof. In some implementations, the lock feature 104 may extend axially, i.e., along central axis 111, from the hinge shaft 102. The lock feature 104 may include a lock surface 104a to engage with a complementary lock surface 108a of the lock slot 108. In other implementations, the lock feature 104 may be a shelf, ledge, or other type of feature that may be cut out of a side of the hinge shaft 102 so as to define the lock surface 104a.

[0017] The lock bracket 106 may be a rigid or semi-rigid member. In some implementations, the lock bracket 106 may be a substantially planar beam, plate, panel, or other component, and/or may have suitably rigid and planar portions therein. In further implementations, the lock bracket 106 may have periphery or outer profile which substantially matches that of an inside of a housing, or portion thereof, of an electronic device. In other words, the lock bracket 106 may have such a shape in some implementations so as to fit within a corner, side, or other portion of a housing of an electronic device.

[0018] The hinge lock 100 may further include a bias member 110. The bias member 110 may be a resilient component that is capable of elastic deformation. In other words, the bias member 110 may be able to return to its original shape after undergoing a deformation. In some implementations, the bias member 110 may be a spring, and, in further examples, may be a coil

spring. In other implementations, the bias member 110 may be an extension spring, torsion spring, leaf spring, or other type of component capable of applying a bias force or urging against the lock bracket 106. The bias member 110 may apply a bias force against the lock bracket 106 in order to urge the lock bracket 106 in a direction away from the hinge shaft 102 and/or the lock feature 104 thereof, e.g., along direction 107. The bias member 110 may therefore resist the engagement of the lock bracket 106 with the hinge shaft 102.

[0019] The lock bracket 106 may have a lock slot 108. The lock slot 108 may be a pocket or depression extending into the lock bracket 106 or may be a window or aperture extending through a thickness of the lock bracket 106, e.g., through the entire thickness from one side to the other. In further implementations, the lock slot 108 may also extend to a peripheral edge of the lock bracket 106, i.e., the lock slot 108 may be a cutout, slot, or notch extending into the lock bracket 106 from such a peripheral edge.

[0020] In some implementations, the lock slot 108 may have a complementary profile so as to receive the lock feature 104 of the hinge shaft 102. In other words, the lock slot 108 may have a profile, size, and/or shape that substantially matches or can accommodate the shape and structure of the lock feature 104. Referring additionally to Fig. 1B, another perspective view of example hinge lock 100 is illustrated. The lock feature 104 may be able to slidably insert into the lock slot 108, for example, along direction 105, as the lock bracket 106 is moved toward the hinge shaft, for example along direction 109, as illustrated in Fig. 1B. In some implementations, the lock slot 108 of the lock bracket 106 may slidably engage with the hinge shaft 102, or the lock feature 104 thereof, along the central axis 111 of the hinge shaft 102. Such sliding engagement of the lock bracket 106 with the hinge shaft 102 along direction 109 may be resisted by, or against the urging of, the bias member 110. Thus, a force used to move the lock bracket 106 along direction 109 into engagement with the hinge shaft 102 may be greater than a resistive force or urging of the bias member 110, which urges against the lock bracket 106 along direction 107, opposite to direction 109.

[0021] Referring additionally to Fig. 1C, a front view of the example hinge lock 100 is illustrated, wherein the lock bracket 106 is engaged with the hinge shaft 102. In some examples, the fit between the lock slot 108 and the lock feature 104 may be sufficiently tight so as to block or prevent rotation of the hinge shaft 102 or lock feature 104 thereof within the lock slot 108, for example along rotational direction 113, which may be a rotational direction about the central axis

111 of the hinge shaft 102. In other words, in order to prevent rotation of the hinge shaft 102 about its central axis 111, the hinge shaft 102 may be rotationally fixed relative to the lock slot 108, and thus the lock bracket 106, when the lock feature 104 is engaged with the lock slot 108. In some implementations, the lock surface 104a of the lock feature 104 may mate or abut against the complementary lock surface 108a of the lock slot 108 so as to block or prevent rotation of the lock feature 104 within the lock slot 108. In further implementations, the lock feature 104 may have multiple lock surfaces, and the lock slot 108 may have multiple complementary lock surfaces to mate or abut against the lock surfaces of the lock feature 104 in order to prevent or block rotation of the lock feature 104 within the lock slot 108.

[0022] Referring now to Fig. 2A, a perspective view of an example electronic device 201 having an example hinge lock 200 is illustrated. Example hinge lock 200 may be similar to example hinge lock 100, described above. Further, the similarly-named elements of example hinge lock 200 may be similar in function and/or structure to the respective elements of example hinge lock 100, as they are described above. Electronic device 201 may include a housing 212. The housing 212 may be a frame, enclosure, chassis, or other outer protective or structural element of the electronic device 201 or may even be an aesthetic component of the electronic device 201. In some implementations, the housing 212 may include a base and sidewalls. The housing 212 may be a component that mechanically supports, houses, protects, or otherwise contains other components of the electronic device 201. Such other components may include processors, storage drives, circuit boards or system boards, memory, cooling components, user interface components such as keyboards, touch pads, touch screens, or other components. Such components are omitted from Fig. 2A for clarity. In some implementations, the housing 212 may be a housing or outer case, or a portion thereof, of a notebook or clamshell-style computing device.

[0023] Referring additionally to Fig. 2B, a detail perspective view of the electronic device 201 is illustrated. Note, a portion of the housing 212 is shown as a cutaway to more clearly illustrate hinge lock 200. The electronic device 201 may further include a hinge 214. In some implementations, the hinge 214 may attach the housing 212 to another portion of the electronic device 201, e.g., a second housing, which may contain other components of the electronic device 201. The hinge 214 may be rotatably disposed within or attached to the housing 212 so as to be able to rotate relative to the housing 212.

[0024] The hinge lock 200 may be disposed, at least partially, within the housing 212 and may include a hinge shaft 202 attached to the hinge 214. The hinge shaft 202 may be fixedly attached to the hinge, either directly or indirectly, e.g., through intermediary components, such that, upon the hinge shaft 202 rotating relative to the housing 212, e.g., about a central axis of the hinge shaft 202, the hinge 214 also rotates relative to the housing 212, and vice versa. Thus, if the hinge shaft 202 is rotatably or rotationally fixed relative to the housing 212, i.e., cannot rotate relative to the housing 212 or is fixed about the central axis, then the hinge 214 may also be rotationally fixed relative to the housing 212 and unable to rotate.

[0025] The hinge lock 200 may also include a lock bracket 206 to engage with the hinge shaft 202. In some examples, the lock bracket 206 may slidably engage with the hinge shaft 202. In further implementations, the lock bracket 206 may include a lock slot 208 to slidably receive and engage with a lock feature 204 of the hinge shaft 202 in order to engage the lock bracket 206 with the hinge shaft 202. Upon the hinge shaft 202 becoming engaged with the lock bracket 206, i.e., the lock feature 204 becoming engaged with the lock slot 208, the lock feature 204 is unable to rotate, e.g., about the central axis, within or relative to the lock slot 208. As such, upon the lock bracket 206 becoming engaged with the hinge shaft 202, the hinge shaft 202, and thus the hinge 214 as described above, is blocked or prevented from rotating about the central axis relative to the housing 212.

[0026] The hinge lock 200 may also include a bias member to urge the lock bracket 206 away from or out of engagement with the hinge shaft 202. In some implementations, the hinge lock 200 may include a plurality of bias members, for example, first bias member 210a and second bias member 210b, referred to collectively as bias members 210. Each of the bias members 210 may urge the lock bracket 206 or exert a resistive force against movement of the lock bracket 206 towards engagement with the hinge shaft 202. In some implementations, the bias members 210 may be arranged in an array or aligned along a length of the lock bracket 206. In further implementations, each of the bias members 210 may be disposed on or around a guide post, e.g., first guide post 222a and second guide post 222b, referred to collectively as guide posts 222. Each of the guide posts 222 may limit the direction in which the bias members 210 may be deformed. For example, guide posts 222 may only allow each of the bias members 210 from being deformed along the direction in which the lock bracket 206 is to travel to engage with the hinge shaft 202.

[0027] Housing 212 may further include a lock window 224. In some implementations, the lock window 224 may be an aperture, slot, or other type of opening extending through a thickness of a wall of the housing 212. In further implementations, the lock window 224 may be disposed in a sidewall of the housing 212. In yet further implementations, the lock window 224 may be disposed in the housing 212 in a location near or adjacent to the location of the lock bracket 206 within the housing 212. Thus, an object or component extending through the lock window 224 may be able to interface, engage, or press against the lock bracket 206.

[0028] In some implementations, the housing 212 of the electronic device 201 may receive an external device lock 216 through the lock window 224. Thus, the lock window 224 may have a size, shape, and/or structure to receive the external device lock 216, or a locking lug 218 thereof, through the lock window 224. The locking lug 218 may be able to insert into, and extend through, the locking window 224 to engage with the lock bracket 206, as described below with regard to Fig. 2C. The external device lock 216 may be a device to be used in conjunction with an electronic device so as to lock or secure the electronic device to a particular location or object. As such, the external device lock 216 may have a locking cable 220. Locking cable 220 may be able to wrap around or be otherwise secured to an object near the electronic device. Further, the external device lock 216, or the locking lug 218 thereof, may be inserted into the lock window 224 and rotated or otherwise secured within the lock window 224 so as to not be able to be removed, thereby creating a secure engagement between the external device lock 216 and the housing 212, and thus the electronic device 201. As such, when employed, the external device lock 216 may be able to secure or otherwise prevent the unauthorized removal of the electronic device 201 from a particular location or object. In some implementations, the external device lock 216 may be a commonly used or standard device lock, e.g., a cable lock or a Kensington lock (K-Lock). In some implementations, the external device lock 216 may be another type of securing device other than a cable lock.

[0029] Referring now to Fig. 2C, another detail perspective view of the electronic device 201 is illustrated, wherein the external device lock 216, or the locking lug 218 thereof, has been engaged with the lock window 224, and thus the housing 212 of the electronic device 201. Upon being inserted into the lock window 224, the locking lug 218 is to press against or otherwise engage with the lock bracket 206 so as to move or slide the lock bracket 206, against the urging or resistive force of the bias members 210, towards and into engagement with the hinge shaft

202. In other words, the insertion of the external device lock 216 into the lock window 224 slides the lock slot 208 into engagement with the lock feature 204, thereby preventing or blocking rotation of the hinge shaft, along rotational direction 213 about the central axis, relative to the housing 212. The hinge 214, accordingly, is prevented from rotating relative to the housing 212. Therefore, engaging the external device lock 216 with the lock window 224 locks the hinge 214 in position and prevents or blocks it from being rotated.

[0030] Referring now to Fig. 3A, a perspective view of another example electronic device 303 having an example hinge lock 300 is illustrated. Example electronic device 303 and hinge lock 300 may be similar to other example electronic devices and hinge locks, described above. Further, the similarly-named elements of example electronic device 303 and hinge lock 300 may be similar in function and/or structure to the respective elements of other example electronic devices and hinge locks, as they are described above.

[0031] Electronic device 303 may include a first housing 312 and a second housing 326. Electronic device 303 may also include a hinge, or a plurality of hinges, in some implementations, e.g., first hinge 314a and second hinge 314b, referred to collectively as hinges 314. Hinges 314 may be rotatably attached to or engaged with the first housing 312, and the second housing 326 may be attached to the hinges 314. The hinges 314 may rotatably engage the second housing 326 with the first housing 312, such that the first and second housings 312 and 326 can fold against one another to a closed position, and fold or open away from one another to an open position, for example along direction 315. As such, electronic device 303 may be a clamshell-style notebook or laptop computing device in some implementations. In implementations, having only a single hinge, the single hinge may rotatably engage the second housing 326 with the first housing 312. The first housing 312 may have, contain, or otherwise support internal components of the electronic device 303, including but not limited to, processors, system boards, storage drives, memory, thermal or cooling systems, or other components. The first housing 312 may also include, in some implementations, user interface components such as a keyboard, touch pad, mouse buttons, touch screens, or other user interface components. Second housing 326 may include or mechanically support other components of the electronic device 303, e.g., displays, antennas, latches, cameras, microphones, or other components, in some implementations.

[0032] Referring now to Fig. 3B, a detail perspective view of the electronic device 303 is illustrated, specifically a portion of the electronic device 303 including the first hinge 314a. Figs. 3B-3C illustrate the electronic device 303 as being disposed in a closed position, with the second housing 326 folded onto and against the first housing 312. As such, the second housing 326 and the first housing 312 are illustrated as being partially cut away in Figs. 3B-3C to clearly illustrate the example hinge lock 300.

[0033] Hinge lock 300 may include a hinge shaft 302 attached to the first hinge 314a (referred to hereinafter as hinge 314). Hinge lock 300 may also include a lock bracket 306 and a bias member 310. Hinge lock 300, and the constituent components thereof, may be disposed within the first housing 312, in some implementations. Lock bracket 306 may be disposed within the first housing 312 near or adjacent to a lock window 324. Lock window 324 may receive and engage with an external device lock 316, or a locking lug 318 thereof. Further, hinge shaft 302 may be disposed within the first housing 312 near the lock bracket 306 so as to be able to engage with lock bracket 306. Hinge shaft 302 may also be considered in some implementations to be a part of the hinge 314, or a hinge assembly that the hinge 314 may be a part of.

[0034] Hinge shaft 302 may also include a lock feature 304 extending from the hinge shaft 302 towards the lock bracket 306, the lock feature 304 to slidably and removably engage with a lock slot 308 of the lock bracket 306. In this context, removably engage may refer to the ability of the lock feature 304 to slide within the lock slot 308 to engage with the lock slot 308, and to slide out of the lock slot 308 to disengage with the lock slot 308, in a repeatable fashion. Lock slot 308 may engage and disengage with the lock feature 304 in order to engage and disengage the lock bracket 306 with the hinge shaft 302, respectively.

[0035] Referring now to Fig. 3C, another detail perspective view of electronic device 303 is illustrated wherein the external device lock 316 is engaged with the lock window 324, and thus has caused the lock bracket 306 to engage with hinge shaft 302, against the urging of bias members 310. Upon the locking lug 318 of the external device lock 316 being inserted into the lock window 324, the locking lug 318 engages with and pushes on the lock bracket 306 to move the lock bracket 306 along direction 309, against the urging of bias member 310, such that the lock slot 308 engages with the lock feature 304. Once engaged with the lock slot 308, the lock feature 304, and thus the hinge shaft 302, is blocked from rotating along rotational direction 313

relative to the lock bracket 306, and thus the first housing 312. The hinge 314, being fixedly attached to the hinge shaft 302, is also blocked from rotating relative to the first housing 312. The hinge shaft 302 and hinge 314 may be rotationally fixed to a sufficient degree in this position relative to the lock bracket 306 so as to block the second housing 326, being attached to the hinge 314, from being able to move from the closed position illustrated, to the open position illustrated in Fig. 3A. Stated differently, the second housing 326 is rotationally fixed relative to the first housing 312 if the hinge 314 is fixed relative to the first housing 312 such that the second housing 326 cannot move from the closed position to the open position. Referring now to Fig. 3D, another perspective view of electronic device 303 is illustrated as being in the closed position, and wherein the external device lock 316 is engaged with the lock window 324. Thus, the hinge lock 300 is engaged so as to fix the second housing 326 relative to the first housing 312, thereby preventing the second housing 326 from moving along example direction 317 from the closed position to the open position. Therefore, examples of hinge locks disclosed herein may be used in conjunction with an external device lock in order to both physically secure and lock an electronic device to a location or object, and also to physically lock the electronic device in a closed position, thereby preventing unauthorized access to content on the electronic device.

CLAIMS

What is claimed is:

1. A hinge lock, comprising:
 - a hinge shaft having a lock feature;
 - a lock bracket having a lock slot to slidably receive the lock feature to engage the lock bracket with the hinge shaft; and
 - a bias member to urge the lock bracket in a direction away from the lock feature of the hinge shaft.
2. The hinge lock of claim 1, wherein the hinge shaft is rotationally fixed relative to the lock bracket when the lock feature is engaged with the lock slot.
3. The hinge lock of claim 2, wherein the hinge shaft is rotationally fixed to a sufficient degree relative to the lock bracket so as to block a housing attached to the hinge shaft from being able to move from a closed position to an open position when the lock feature is engaged with the lock slot.
4. The hinge lock of claim 1, wherein the lock slot of the lock bracket is to slidably engage with the hinge shaft along a central axis of the hinge shaft.
5. The hinge lock of claim 1, wherein the lock slot is an aperture extending through a thickness of the lock bracket and extending to a peripheral edge of the lock bracket.
6. The hinge lock of claim 5, wherein the lock feature is a protrusion extending axially from the hinge shaft, the lock feature having a lock surface to engage with a complementary lock surface of the lock slot so as to block rotation of the lock feature within the lock slot.
7. An electronic device, comprising:
 - a first housing having a lock window;

a hinge to attach to a second housing; and
a hinge lock disposed within the first housing, the hinge lock comprising:
a hinge shaft attached to the hinge, the hinge shaft having a lock feature;
a lock bracket having a lock slot to slidably receive the lock feature to
engage the lock bracket with the hinge shaft; and
a bias member to urge the lock bracket in a direction away from the lock
feature of the hinge shaft.

8. The electronic device of claim 7, wherein the first housing is to receive an external device lock through the lock window, the external device lock to press against the lock bracket to slide the lock bracket into engagement with the hinge shaft when inserted into the lock window.

9. The electronic device of claim 7, wherein the lock slot is an aperture extending through a thickness of the lock bracket.

10. The electronic device of claim 7, wherein the hinge is rotationally fixed relative to the first housing if the lock bracket is engaged with the hinge shaft.

11. An electronic device, comprising:
a first housing having a lock window;
a hinge;
a second housing attached to the hinge, the hinge to rotatably engage the second housing with the first housing; and
a hinge lock, comprising:
a hinge shaft attached to the hinge, the hinge shaft having a lock feature;
a lock bracket having a lock slot to slidably receive the lock feature to
engage the lock bracket with the hinge shaft; and

a bias member to urge the lock bracket in a direction away from the lock feature of the hinge shaft.

12. The electronic device of claim 11, wherein the hinge shaft is attached to the hinge such that the hinge rotates upon the hinge shaft being rotated along a central axis, and the hinge is fixed relative to the first housing if the hinge shaft is fixed about the central axis.

13. The electronic device of claim 12, wherein the second housing is rotationally fixed relative to the first housing if the hinge is fixed relative to the first housing such that the second housing cannot move from a closed to an open position.

14. The electronic device of claim 11, wherein the first housing is to receive an external device lock through the lock window, and wherein the external device lock is to engage with the lock bracket upon being disposed within the lock window such that the lock bracket is moved into engagement with the hinge shaft.

15. The electronic device of claim 14, wherein the second housing is fixed relative to the first housing if the lock bracket is engaged with the hinge shaft.

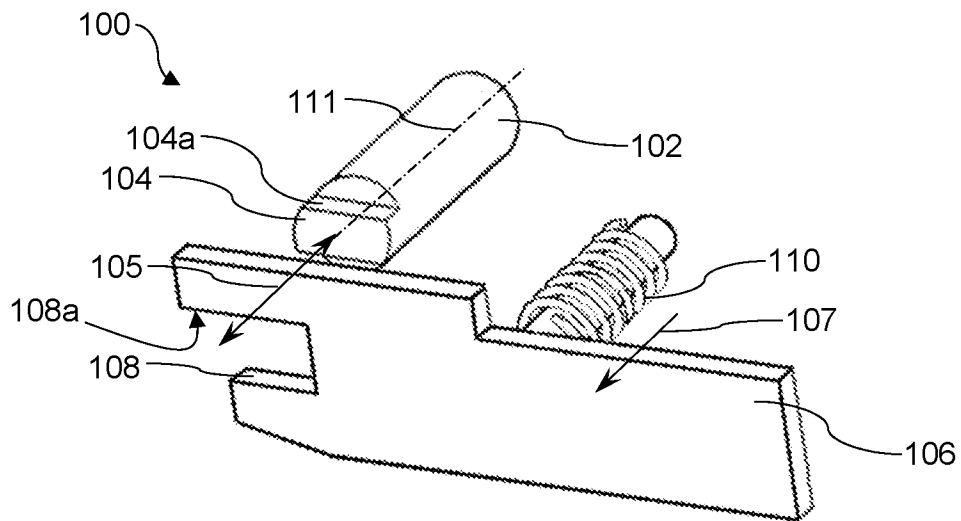


Fig. 1A

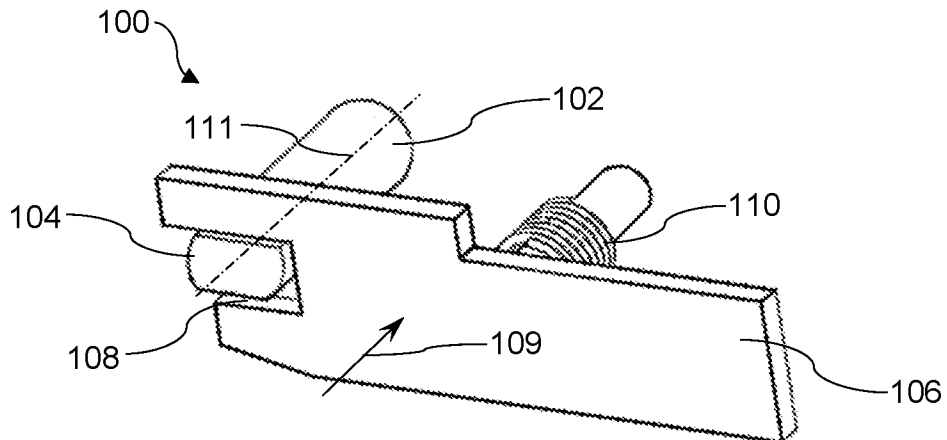


Fig. 1B

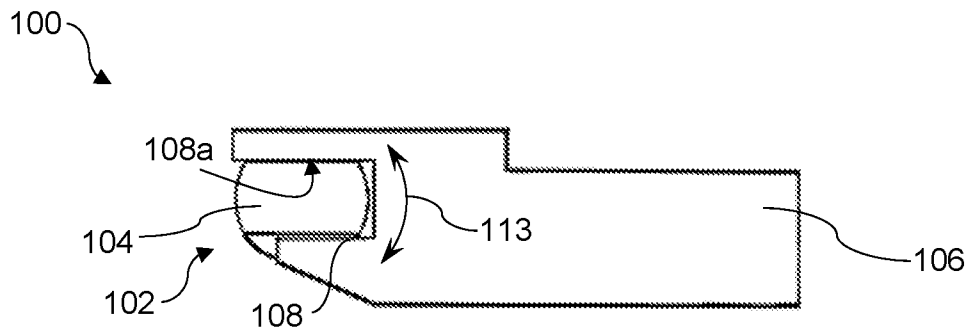


Fig. 1C

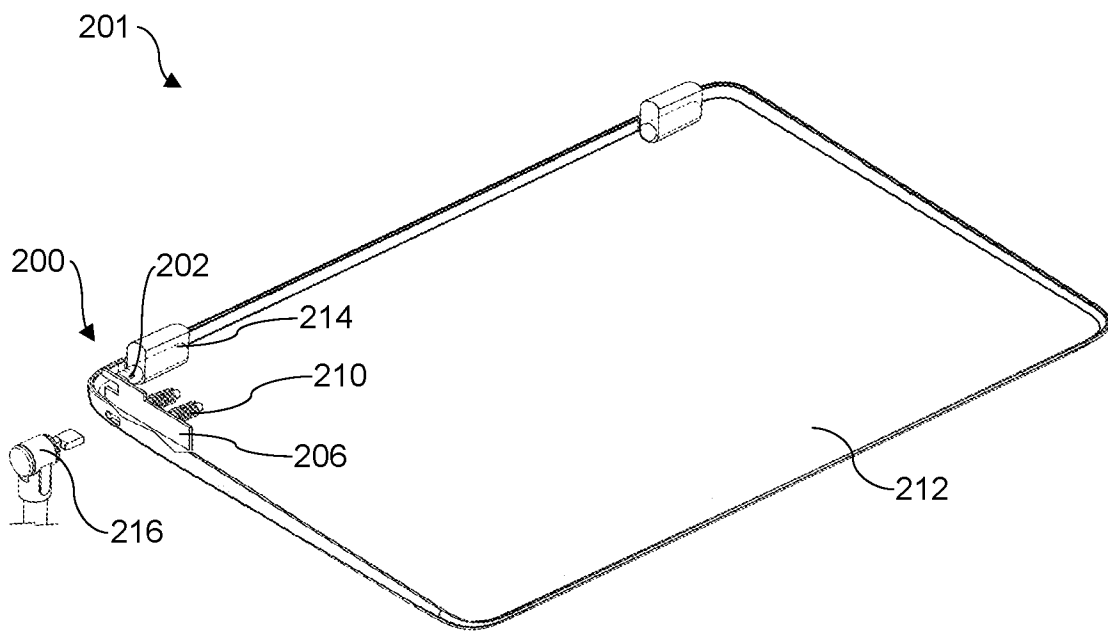


Fig. 2A

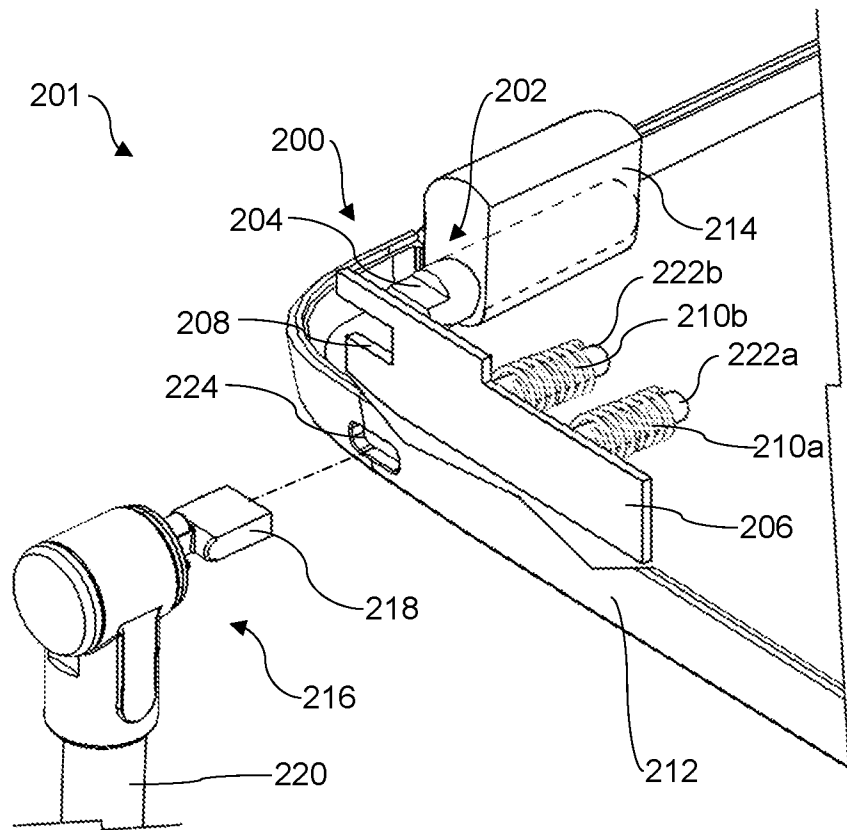


Fig. 2B

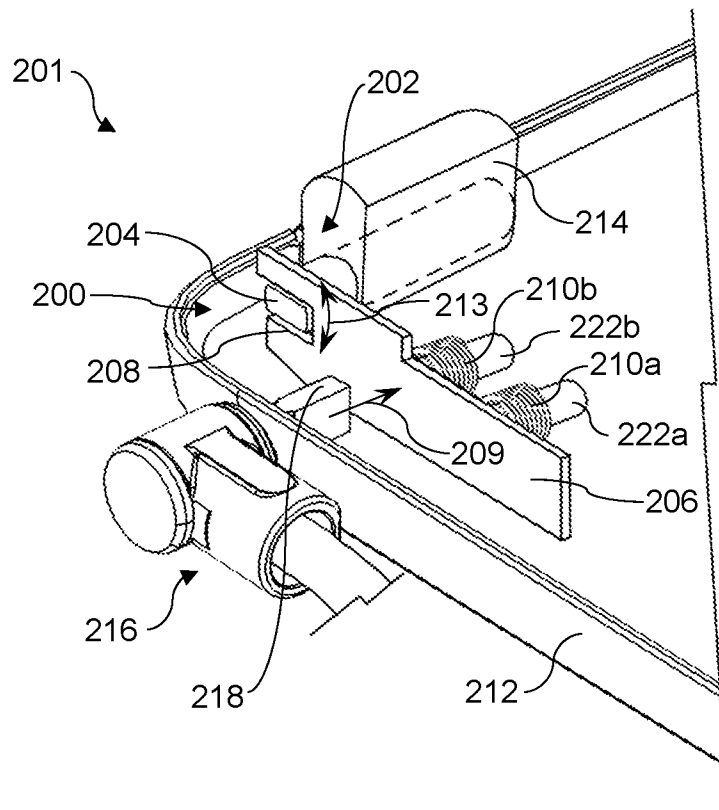


Fig. 2C

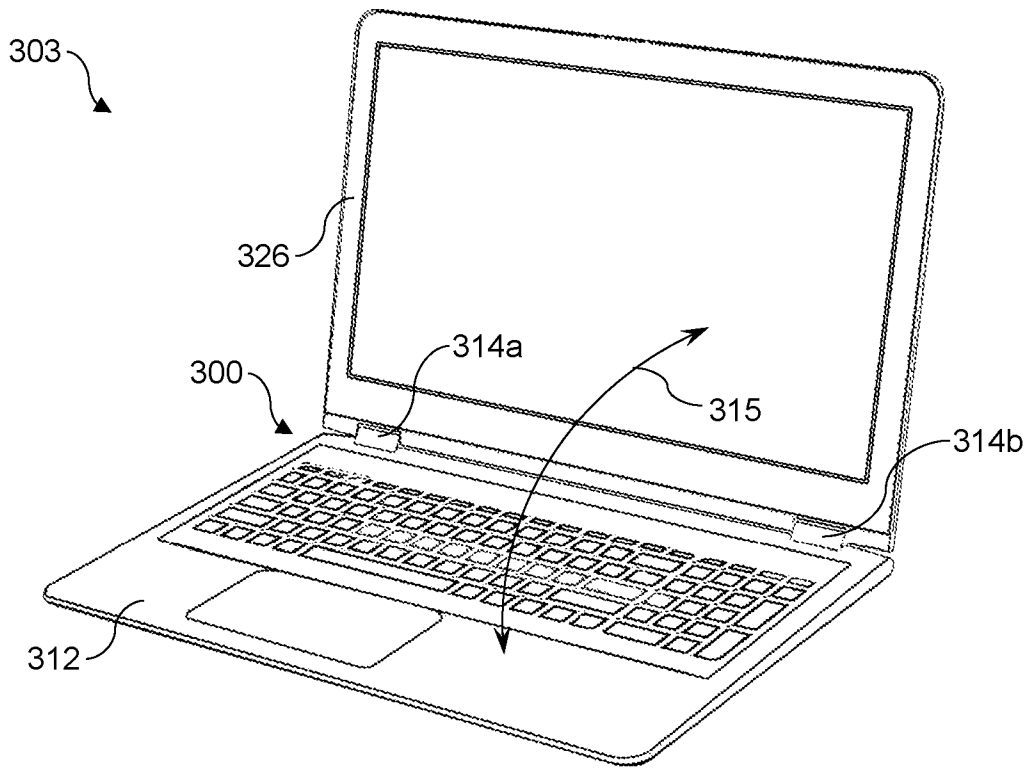


Fig. 3A

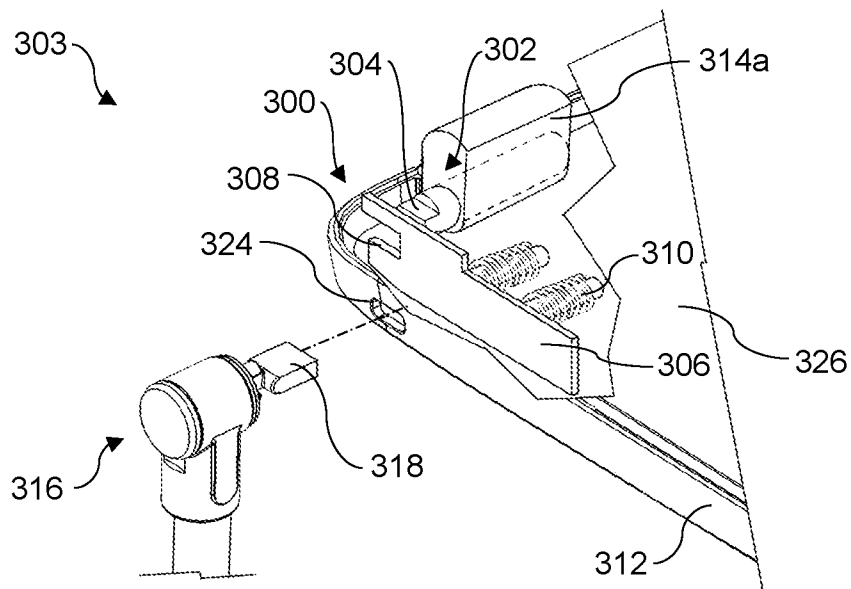


Fig. 3B

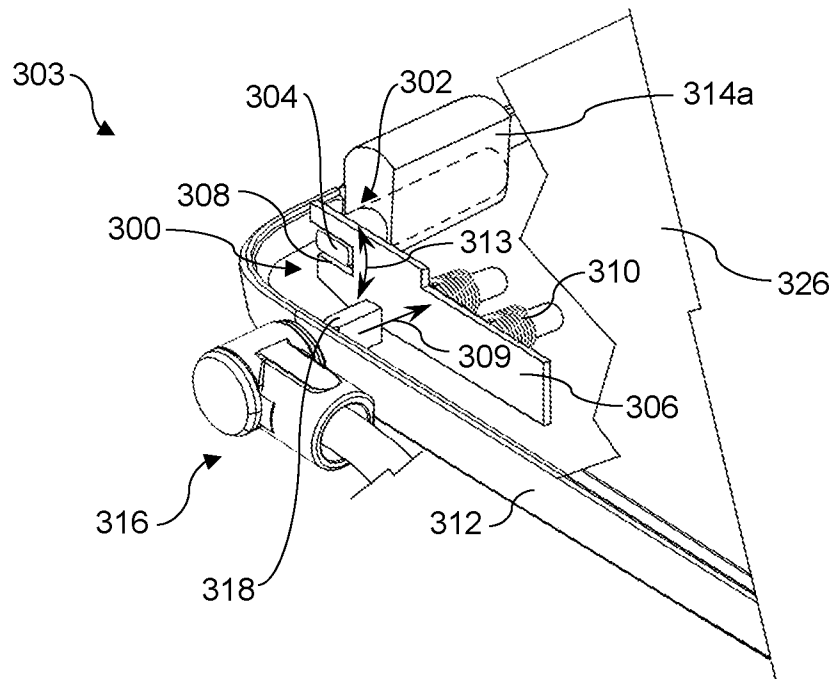


Fig. 3C

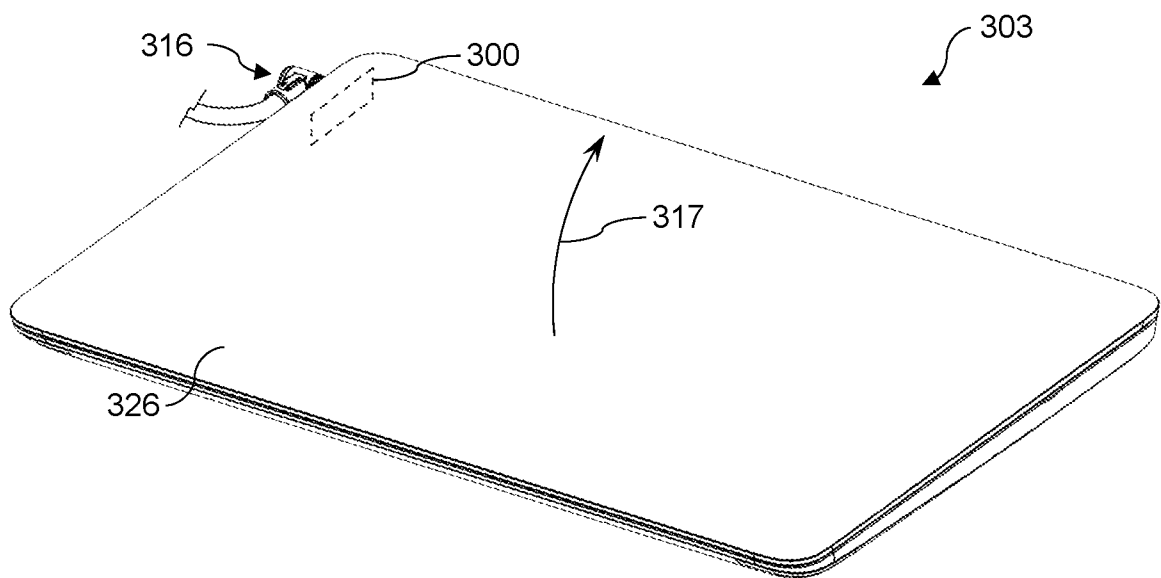


Fig. 3D

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2018/053306

A. CLASSIFICATION OF SUBJECT MATTER <i>G06F 1/16 (2006.01)</i> <i>E05B 63/00 (2006.01)</i> According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) G06F 1/00-1/16, H05K 7/00, E05B 63/00, 65/00 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatSearch (RUPTO internal), USPTO, PAJ, Esp@cenet, DWPI, EAPATIS, PATENTSCOPE		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/0008277 A1 (DELL PRODUCTS L.P.) 12.01.2012, abstract, claims, fig.2, 5b-5h, [0001]-[0005], [0018]-[0026]	1-15
A	US 6034867 A (SAMSUNG ELECTRONICS CO., LTD.) 07.03.2000	1-15
A	US 2017/0115688 A1 (HEWLETT-PACKARD DEVELOPMENT COMPANY, L.P.) 27.04.2017	1-15
A	US 6009568 A (KATOH ELECTRICAL MACHINERY CO, LTD.) 04.01.2000	1-15
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
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"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		
Date of the actual completion of the international search	Date of mailing of the international search report	
13 June 2019 (13.06.2019)	20 June 2019 (20.06.2019)	
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37	Authorized officer I. Doroshenko Telephone No. 8 499 240 25 91	